SPECTRONIC® 21
SPECTROPHOTOMETERS

SERVICE INFORMATION

332201-10062 • 6-0235

Digitized by the Internet Archive
in 2026

https://archive.org/details/manualsplus_12034

SPECTRONIC® 21
SPECTROPHOTOMETERS

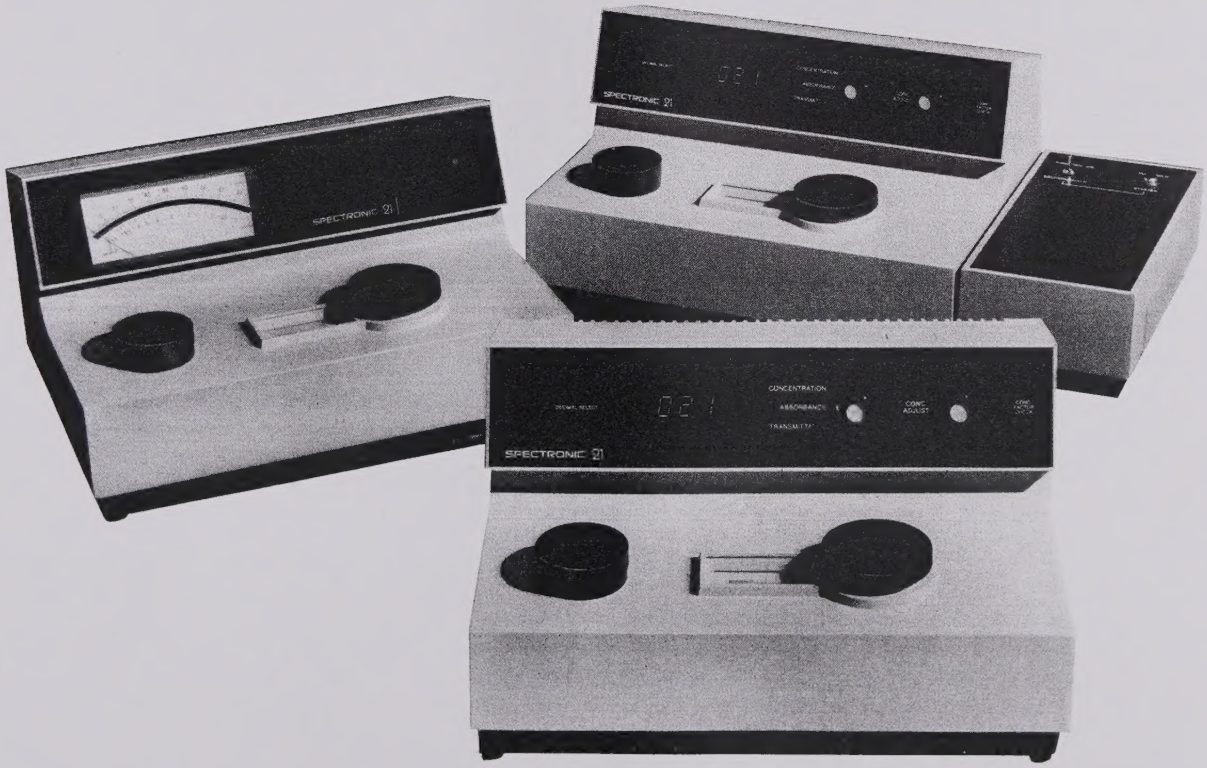
SERVICE INFORMATION

332201-10062 • 6-0235

1-800-654-

MILTON ROY

SPECTRONIC® 21
SPECTROPHOTOMETERS



SERVICE INFORMATION

332201-10061 • 6-0234

SPECTRONIC 21

SPECTROPHOTOMETERS

Service Manual

Cat. No. 332201-10020, Rev. B

Copyright © 1987 by Milton Roy Company.
All rights reserved.

SPECTRONIC is a registered trademark of Milton Roy Company.

Packet Part No. 332201-371

Printed in the U.S.A.

NOTE

This Service Manual contains information, instructions, and specifications for the SPECTRONIC 21 spectrophotometers that were believed accurate at the time this manual was written. However, as part of Milton Roy Company's on-going program of product development, the specifications and operating instructions for these spectrophotometers may be modified or changed from time-to-time. Milton Roy reserves the right to change such operating instructions and specifications. Under no circumstances shall Milton Roy be obligated to notify purchasers of any future changes in either this operator's instruction manual or any other instructions or specifications relating to the SPECTRONIC 21 spectrophotometers, nor shall Milton Roy be liable in any way for its failure to notify purchasers of such changes.

WARRANTY

Milton Roy instrumentation and related accessories are warranted against defects in material and workmanship for a period of one (1) year from the date of delivery. This warranty is provided only if the warranty registration card is returned to Milton Roy within fifteen (15) days after delivery.

This warranty covers all parts (except those specified below) and applies only to equipment which has been installed and operated in accordance with the operator's instruction manual and which has been serviced only by authorized Milton Roy dealers or service personnel. This warranty does not apply to equipment and accessories that have been modified or tampered with in any way, misused or damaged by accident, neglect, or conditions beyond Milton Roy's control.

This warranty does not apply to lamps, glassware, and similar expendable components. However, such parts and components may be warranted by their manufacturer.

Milton Roy is not responsible under this warranty for loss in operating performance due to environmental conditions.

THIS WARRANTY IS IN LIEU OF ALL WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, INCLUDING, BUT NOT LIMITED TO WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR OF MERCHANTABILITY OR OTHERWISE, and states Milton Roy's entire and exclusive liability and the Customer's exclusive remedy for any claim in connection with the sale or furnishing of services, goods or parts, their design, suitability for use, installation, or operations. Milton Roy will in no event be liable for any direct, indirect, special or consequential damages whatsoever, including loss of goodwill, whether grounded in tort (including negligence), strict liability or contract, and Milton Roy's liability under no circumstances will exceed the contract price for the goods and/or services for which liability is claimed.

FCC FOR U.S.A. USERS

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

HOW TO USE THIS MANUAL

The Milton Roy SPECTRONIC 21 Spectrophotometer Service Manual, Catalog No. 332201-10020, Rev. B contains information necessary for qualified personnel to service Milton Roy SPECTRONIC 21 spectrophotometers. This manual is organized into four sections.

The Main Section: Text of Rev. A of the service manual published in 1983. This section is a reproduction and presents useful information on discontinued models, as well as basic theory of operation and service and maintenance procedures that are applicable to all SPECTRONIC 21 spectrophotometers.

Section 5, ACCESSORIES, and Section 6, DIAGRAMS & PARTS LISTS are given only for historical completeness of information related to this series of spectrophotometers.

Tab A: Parts lists, drawings, and schematics for MV (Meter-Visible) Model 33-22-42.

Tab B: Parts lists, drawings, and schematics for DV (Digital-Visible) Model 33-22-41.

Tab C: Parts lists, drawings, and schematics for UVD (Digital-UV/Visible) Model 33-22-43.

Refer to Table 1 on the following page for the location of assembly information for each model. Drawings, schematics, and parts lists applicable to all models are found in Tab A. Those applicable to two models are found in the first referenced tab.

To complete the information on the SPECTRONIC 21 spectrophotometers, add a copy of the SPECTRONIC 21 Operator's Manual (Cat. No. 332241-10001, Rev. F) to this service information binder. The Operator's Manual provides a list of features that Models 33-22-41, 33-22-42, and 33-22-43 have in common, as well as the specifications for each model. It also lists accessories that are currently available.

The General Purpose Sample Compartment (GPSC) Accessory (Catalog No. 332244) is available for use with all models. The General Purpose Sample Compartment Operator's Manual (Catalog No. 332244-1001, Rev. C) should also be added to this binder. See the back section of Tab A for GPSC parts lists, drawings, and schematics.

If there is a service problem which cannot be solved by use of the information in this manual, contact the Milton Roy Service Office.

TELEPHONE:	
Inside New York State	800-327-7053
Outside New York State	800-654-9955
Alaska, Hawaii, and Canada	716-248-4235
TELEX:	444-1036

TABLE 1. Structure and Assembly Interchangeability Table

Description	Drawing No.	332242	332241	332243	TAB
Base Cover Assembly	332201-273	X	X	X	A
Transformer Assembly	332201-679		X		B
Switch Assembly	332201-731	X	X	X	A
Board and Bracket Assembly	332201-1073		X	X	B
Cable Assembly	332201-1648		X	X	B
Flex Circuit Assembly	332201-6074		X	X	B
Display 3 Board Assembly	332201-6174		X	X	B
Potentiometer Board Cable Assembly	332201-6184		X	X	B
AMP/Detector PC Board Assembly	332201-6204	X	X	X	A
AMP/Detector Schematic (Digital)	332201-60008	X	X	X	A
Transformer Assembly	332202-651	X			A
Flex Circuit Assembly	332225-683	X			A
Cable Assembly	332225-1627	X	X	X	A
Potentiometer Board Assembly	332225-6074	X			A
UV Power Supply Board Assembly	332225-6114			X	C
AMP/Detector Schematic (Meter)	332225-60003	X	X	X	A
UV Power Supply Schematic	332225-60004			X	C
Transformer Assembly	332226-641			X	C
Stage Assembly	332230-150	X			A
Model 332241 Cover Assembly	332241-170		X		B
Model 332241 Main Assembly	332241-200		X		B
Model 332242 Cover Assembly	332242-170	X			A
Model 332242 Main Assembly	332242-200	X			A
Model 332243 Cover Assembly	332243-170			X	C
Model 332243 Main Assembly	332243-200			X	C
Lamp House Assembly	332243-250			X	C
GPSC Cover Assembly	332244-135	X			A
GPSC Main Assembly	332244-200	X			A

THE BAUSCH & LOMB

SPECTRONIC® 21

SPECTROPHOTOMETER

SERVICE MANUAL

BAUSCH & LOMB

Copyright 1983 by Bausch & Lomb Incorporated, Rochester, New York 14625

332201-871, Rev. A.

820 Linden Avenue, Rochester, New York 14625

Printed in U.S.A.

PUBLICATION COMMENT SHEET

Use this feedback sheet to make us aware of any comments/criticisms regarding this publication. Please comment on adequacy, quality, useability, format, parts of manual not used, etc. Specific errors or deficiencies should be referenced by paragraph and/or page number.

Name	Job Title	Date	Location

Publication No.	Date and Rev. No.	Title of Publication

Page/Para.	Description of error or comment (be specific)

TABLE OF CONTENTS

Page

SECTION 1. GENERAL

1.1 Instrument Warranty 1-1
1.2 How to Use This Service Manual 1-1
1.3 General Safety Rules 1-1
1.4 Description of Models 1-2
1.4.1 Digital-Visible, Cat. Nos. 33-22-01 and 33-22-44 1-2
1.4.2 Meter-Visible, Cat. Nos. 33-22-02 and 33-22-42 1-3
1.4.3 UV-Meter, Cat. No. 33-22-25 1-4
1.4.4 Digital-UV/Visible, Cat. Nos. 33-22-26 and 33-22-43 1-5
1.5 Optical System 1-6
1.6 Basic Electronics System 1-7
1.7 Electronic Theory of Operation 1-8
1.7.1 Analog Circuits 1-8
1.7.2 DVM Circuits 1-9
1.7.3 D/A Converter Accessory 1-11
1.7.4 Power Supplies 1-11

SECTION 2. INSTALLATION

2.1 General 2-1
2.2 Line Voltage Adaptation 2-1

SECTION 3. SERVICE

3.1 Introduction 3-1
3.2 Physical Inspection 3-1
3.3 Performance Checklist with Troubleshooting Charts 3-2
3.3.1 Performance Checklist, Digital-Visible (DV) Model 3-2
3.3.2 Troubleshooting Chart, Digital-Visible (DV) Model 3-3
3.3.3 Performance Checklist, Motor-Visible (MV) Model 3-5
3.3.4 Troubleshooting Chart, Motor-Visible (MV) Model 3-6
3.3.5 Performance Checklist, UV-Meter (UV-M) Model 3-7
3.3.6 Troubleshooting Chart, UV-Meter (UV-M) Model 3-8
3.3.7 Performance Checklist, UV-Digital (UV-D) Model 3-10
3.3.8 Troubleshooting Chart, UV-Digital (UV-D) Model 3-11
3.4 Service Equipment and Tools 3-12
3.5 Recommended Service Spare Parts 3-12

SECTION 4. MAINTENANCE

4.1 Introduction 4-1
4.2 Fuse Replacement 4-1
4.3 Lamp Replacement 4-1
4.3.1 Digital- and Meter-Visible Model, Cat. Nos. 33-22-01, 33-22-02, 33-22-41, and 33-22-42 4-1
4.3.2 UV Models, Cat. Nos. 33-22-25, 33-22-26 and 33-22-43 4-2
4.4 Lamp Alignment 4-2
4.5 Detector Maintenance 4-3
4.6 Sample Holder Maintenance 4-4
4.7 Wavelength Calibration Procedure 4-4
4.8 Electronic Calibration 4-5
4.8.1 Infinite-Absorbance Calibration 4-5
4.8.2 0%T Calibration 4-5
4.8.3 Set Absorbance Calibration 4-5
4.8.4 Absorbance to Transmittance Calibration 4-5
4.8.5 Concentration Factor Calibration 4-6
4.8.6 Recorder Voltage Adjust 4-6
4.9 T/A Conversion Table 4-7
4.10 Removals & Replacements 4-7
4.10.1 Main Cover 4-7
4.10.2 Amp/Detector Board -6164 4-7
4.10.2.1 Sensor Board -6036 4-8
4.10.3 DVM Board -6094 4-8
4.10.3.1 Display Board -6084 4-8
4.10.4 UV Power Supply Board -6024 4-8
4.10.5 Chopper Motor -681 4-8
4.10.6 Sync. Detector -223 4-8
4.10.7 Main Flex Circuit -6144 4-8
4.10.8 Transformer (all) 4-8
4.10.9 Flex Circuit -6074 4-9
4.10.10 Lamp House 4-9
4.10.11 Monochromator Assembly 4-9
4.10.11.1 Grating 4-9
4.10.11.2 Filter 4-9
4.10.11.3 Mirrors 4-10
4.10.11.4 Mirror Replacement and Alignment 4-10

SECTION 5. ACCESSORIES

5.1 Readout Devices 5-1
5.1.1 DP-110 Data Processor 5-1
5.1.2 10" Strip Chart Recorder 5-2
5.1.3 Digital-To-Analog Converter 5-2
5.2 Sample Handling Accessories 5-2

SECTION 6. DIAGRAMS/PARTS LISTS

6.1 Introduction 6-1
6.2 Explanation of Model Structure Table 6-1
6.3 Model Structure Table 6-2

SECTION 1.
GENERAL

1.1 WARRANTY

Bausch & Lomb's Instruments & Systems Division instrumentation and related accessories are warranted to the consumer against defects in material and workmanship for a period of one year from date of installation. To validate this warranty, the registration card must be returned within 15 days of purchase.

Responsibility for loss in operating performance due to environmental conditions such as humidity, dust, corrosive chemicals, deposition of oil or other foreign matter, spillage, or other conditions beyond our control cannot be accepted by Bausch & Lomb. Instrumentation in this category may be restored to original operating condition upon issuance of a purchase order to cover labor, expenses and/or replacement of parts.

This warranty covers all parts (except those referred to below) and shipping expense from Rochester, New York. This warranty applies only to instruments and accessories which have been installed and operated in accordance with our reference manuals, have not been tampered with in any way, misused, suffered damage through accident, neglect or conditions beyond our control, and have been serviced only by our authorized dealers or Instruments & Systems Division service personnel.

Lamps, glassware, electronic tubes, photodetectors and similar expendable components are exempt from this warranty and carry any warranty offered by the component manufcturer.

There are no other warranties, express or implied, and Bausch & Lomb shall not be liable under any circumstances for consequential damages.

1.2 HOW TO USE THIS SERVICE MANUAL

This service manual is intended for the use of Bausch & Lomb service personnel or qualified customer service personnel.

Service procedures in conjunction with the drawings provided should enable service personnel to isolate a malfunction to the component or subassembly level. With the parts lists provided, the appropriate replacement part or subassembly may be readily determined. To facilitate the obtaining of a part from local sources, sufficient detailed descriptions have been provided in the parts lists.

Alignment and calibration procedures have been provided to enable service personnel to restore an instrument to within electrical, optical, and mechanical specifications in the event a part or subassembly has been replaced or repaired.

1.3 GENERAL SAFETY RULES

When servicing the SPECTRONIC 21 spectrophotometer, certain safety precautions should always be kept in mind:

a. The instrument employs high voltages. Use extreme caution if it is ever necessary to operate the instrument with the cover removed.

b. Power should always be disconnected from the instrument when removing, replacing, or repairing a component or a printed circuit board.

c. After the instrument is turned off for servicing, allow sufficient time for capacitors to discharge before servicing takes place.

d. Use only properly rated fuses.

e. When cleaning the instrument, do not use steel wool, emery, sandpaper or files.

f. Use only a non-flammable, non-toxic solvent for cleaning.

g. When servicing has been completed, thoroughly inspect the instrument for loose boards, loose cables, cold solder joints, loose hardware, wire bits, etc.

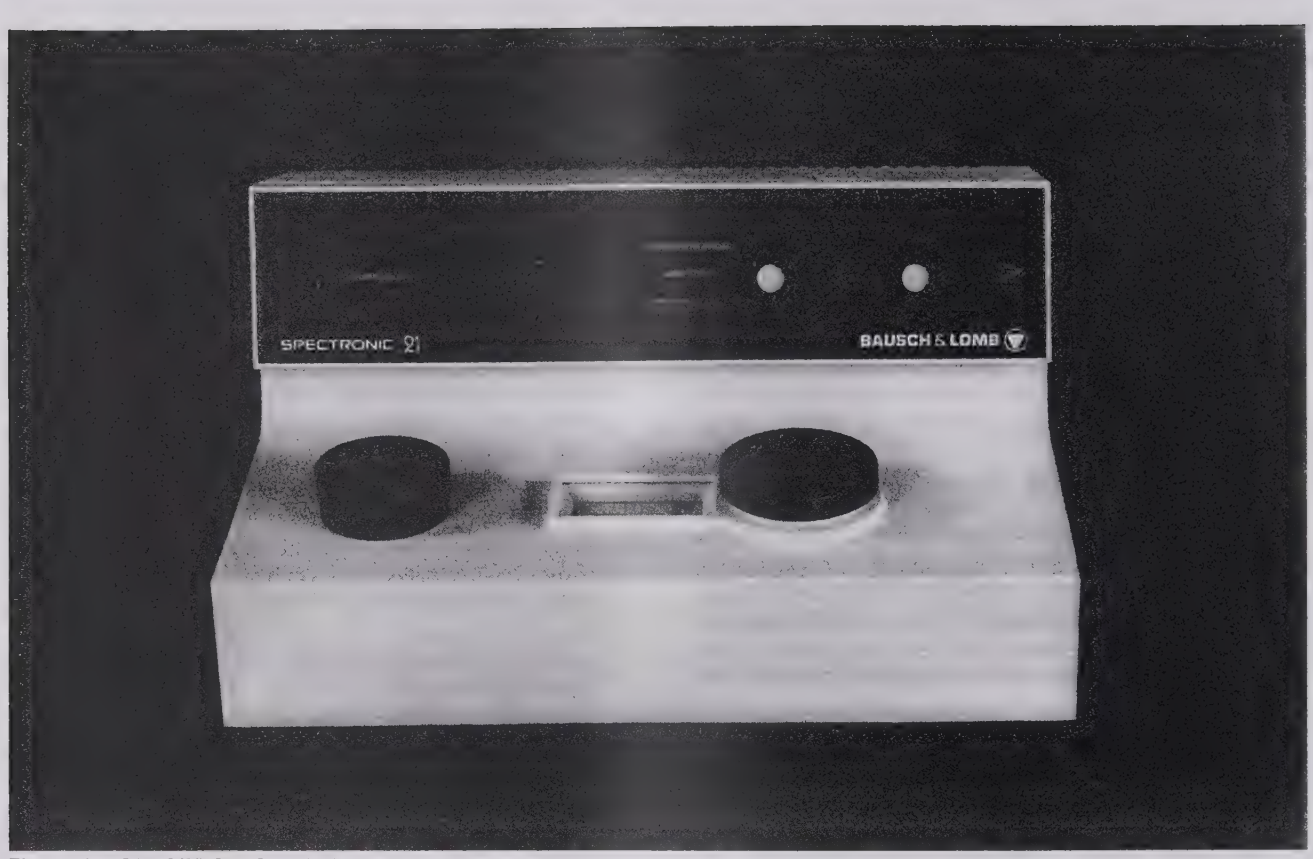


Figure 1. SPECTRONIC 21 DV Spectrophotometer

1.4.1 SPECTRONIC 21 DV Spectrophotometer, Cat. No. 33-22-01/33-22-41

WAVELENGTH RANGE

The DV model uses a tungsten lamp to provide an uninterrupted wavelength range of 340-1000nm.

READOUT

The digital display allows the operator to easily and accurately read in any of three operating modes: transmittance, absorbance, or concentration. A three-position sensitivity switch allows the operator to select the desired instrument gain setting. For values outside the photometric range, the left-hand digit position will display a "⊔" for underrange or an "□" for overrange. To save time and eliminate calculation errors, the concentration mode yields results directly in concentration units. A Factor-Set button provides an extra check on operating conditions in the concentration mode.

ACCESSORIES SUPPLIED

The instrument is supplied complete with:

1. Universal test tube holder
2. Spare tungsten lamp
3. One dozen 10mm pathlength test tubes
4. Operator's manual
5. Dust cover
6. Calibration screwdriver
7. Occluder block

SPECIFICATIONS

Wavelength Range	340-1000nm
Wavelength Accuracy	Better than 2nm at 365nm and 546nm
Wavelength Readability	1.0nm
Wavelength Repeatability	Better than 1nm
Spectral Slit Width	10nm
Stray Radiant Energy	0.05% (typical) at 340nm
Photometric Readout	Digital display, selectable for linear transmittance (T), absorbance (A), or concentration (C), and A to C conversion factor
Photometric Range	00.0 - 100.0% in T .000 - 2.000 in A 000 - 2000 in C
Photometric Noise	Less than .1%T near 100%T .001A near 0.00A .002A near 1.00A
Photometric Linearity	Better than .2%T (.002A near .5A)
Photometric Accuracy	Better than .3%T (0.003A at 0.4A)
Long-term Drift	0.003A per hour
Zero Drift in Transmittance (T)	Less than .1%T per day

Accessory Output	Analog, in %T, >1 volt D.C. (adjustable). BCD, TTL Positive True Logic
Dispersing Element	Reflection diffraction grating, 1200 lines/mm
Power Consumption	45 watts nominal
Voltage Requirements	Selectable: 100V, 115V, 220V, 240v, 50/60 Hz
Size	14½" W x 10½" D x 8½" H (36.8cm W x 26.7cm D x 21.6cm H) Add 5½" (14cm) to width for General Purpose Sample Compartment
Weight	16½ lbs. (6.2kg) Add 3½ lbs. (1.3kg) for General Purpose Sample Compartment

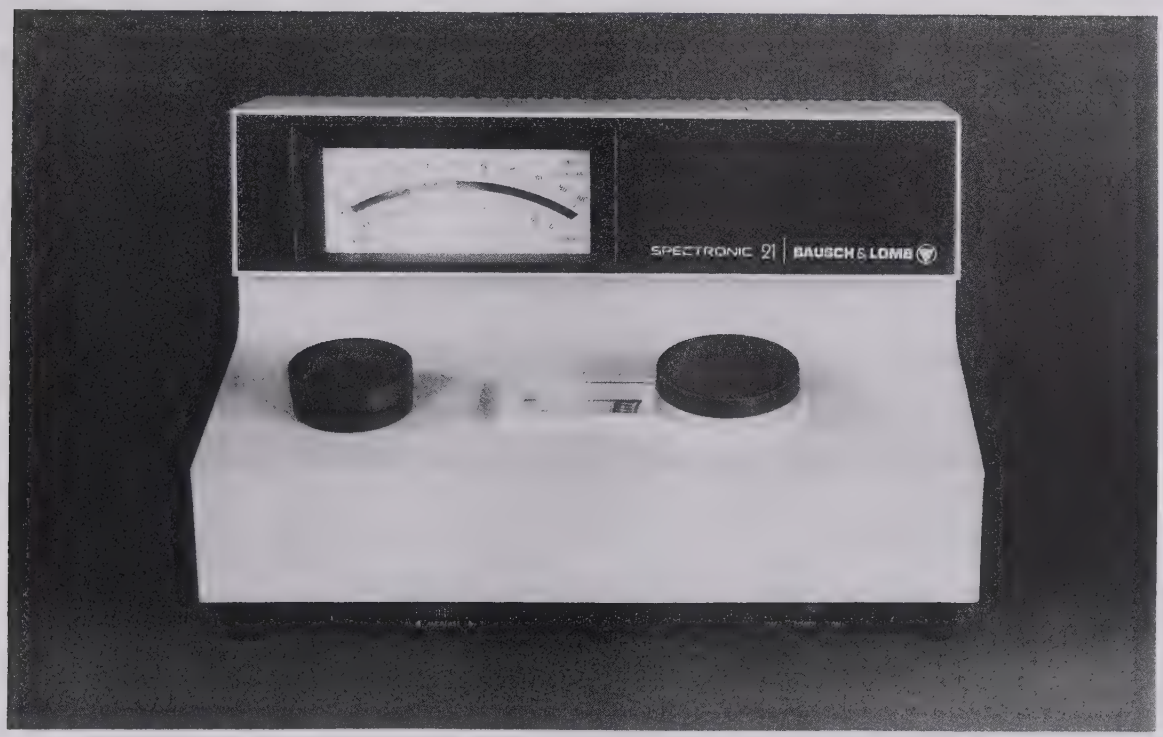


Figure 2. SPECTRONIC 21 MV Spectrophotometer

1.4.2 SPECTRONIC 21 MV Spectrophotometer, Cat. No. 33-22-02/33-22-42

WAVELENGTH RANGE

The MV model of the SPECTRONIC 21 series, shown in Figure 2, uses a tungsten lamp to provide an uninterrupted wavelength range of 340-1000nm.

READOUT

The 5½" (14cm) meter is mirrored to prevent parallax error, is linear in transmittance, and is also calibrated in absorbance. The meter scale reads from 00.0 to 100% transmittance with linear scale divisions at every 1% transmittance. An analog output permits the use of recording devices to record results in percent transmittance.

ACCESSORIES SUPPLIED

The instrument is supplied complete with:

1. Universal test tube holder
2. Spare tungsten lamp
3. One dozen 10mm pathlength test-tube cuvettes
4. Operator's manual
5. Dust cover
6. Calibration screwdriver
7. Occluder block
8. Adapter for rectangular cuvettes

SPECIFICATIONS

Wavelength Range	340-1000nm
Wavelength Accuracy	Better than 2nm at 365nm and 546nm
Wavelength Readability	1.0nm
Wavelength Repeatability	Better than 1nm
Spectral Slitwidth	10nm
Stray Radiant Energy	0.05% (typical) at 340nm
Photometric Readout	5½" (14cm) meter, linear transmittance (T), non-linear absorbance (A), mirrored scale
Photometric Range	0-100%T, 0-2A
Photometric Noise	Less than 0.1%T near 100%T
Photometric Linearity	Better than 1.0%T at meter Better than 0.2%T at analog output
Photometric Accuracy	Better than 0.3%T at analog output
Long-term Drift	0.003A per hour
Zero Drift	Less than 0.1%T per day
Accessory Output	Analog in %T, 1 volt (adjustable)
Dispersing Element	Reflection grating, 1200 lines/mm
Power Consumption	40 watts
Voltage Requirements	Selectable: 100V, 115V, 220V, 240V, 50/60 Hz
Size	14½" W x 10½" D x 8½" H (36.8cm W x 26.7cm D x 21.6cm H) Add 5½" (14cm) to width for General Purpose Sample Compartment
Weight	16½ lbs. (7.3kg) Add 3½ lbs. (1.6kg) for General Purpose Sample Compartment.

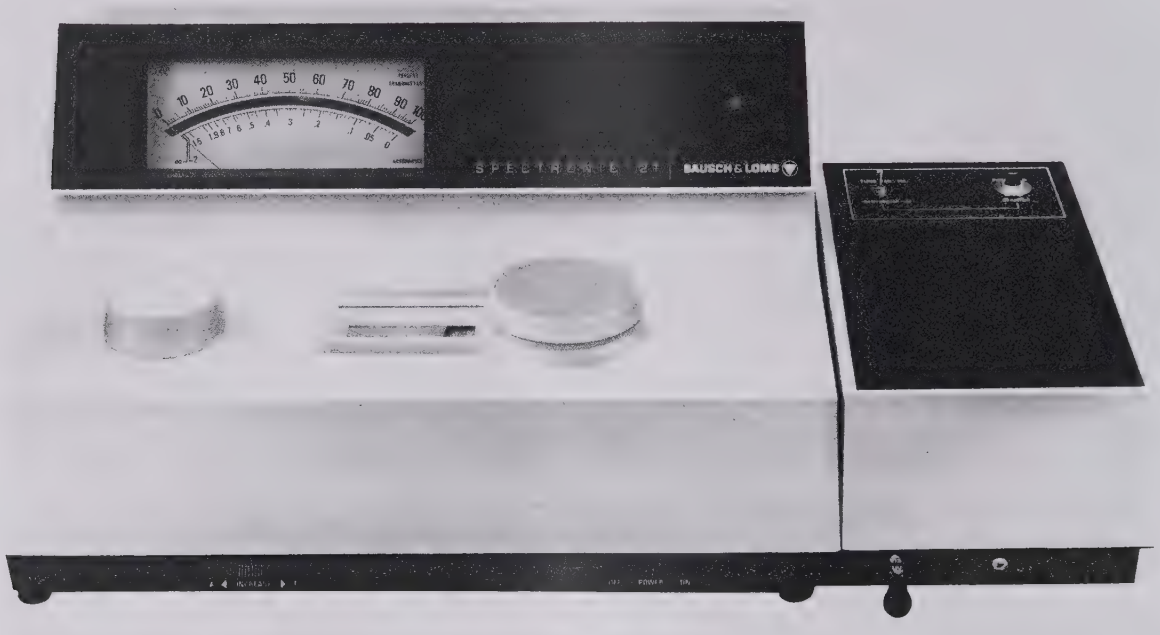


Figure 3. SPECTRONIC 21 Model UVM Spectrophotometer

1.4.3 SPECTRONIC 21 UVM Spectrophotometer, Cat. No. 33-22-25

WAVELENGTH RANGE

The UVM model, shown in Figure 3, has an external lamp house containing both the tungsten and deuterium lamps which provide a wavelength range of 200-1000nm.

READOUT

The 5½" (14cm) meter is mirrored to eliminate parallax error. The meter is linear in transmittance and is also calibrated in absorbance. The meter scale reads from 00.0 to 100% transmittance with linear scale divisions at every 1% transmittance. An analog output permits the use of recording devices to record results in percent transmittance.

ACCESSORIES SUPPLIED

The instrument is supplied complete with:

1. Universal test tube holder
2. Spare tungsten lamp
3. One dozen 10mm pathlength tubes
4. Operator's manual
5. Dust cover
6. Calibration screwdriver
7. Occluder block

Wavelength Range	200-1000nm
Wavelength Accuracy	Better than 2nm
Wavelength Readability	1.0nm
Spectral Slitwidth	10nm

Stray Radiant Energy	Less than .3% at 220nm
Photometric Readout	5½" (14cm) meter, linear transmittance (T), non-linear absorbance (A), mirrored scale
Photometric Range	0-100%T, 0 -2A
Photometric Noise	Less than .1%T near 100%T
Photometric Linearity	Better than 1.0%T at meter Better than .2%T at analog output
Long-term Drift	Less than .5%T per hour
Zero Drift	Less than .1%T per day
Accessory Output	Analog in %T, >1 volt D.C. (adjustable)
Monochromator	Crossed Czerny-Turner
Dispersing Element	Reflection diffraction grating, 1200 lines/mm
Power Consumption	Tungsten lamp - 40 watts nominal Deuterium lamp - 60 watts nominal
Voltage Requirements	Selectable: 100V, 115V, 220V, 240v, 50/60 Hz
Size	20" W x 10½" D x 8½" H (50cm W x 26.7cm D x 21.6cm H) Add 5½" (14cm) to width for General Purpose Sample Compartment
Weight	22 lbs. (8.4kg) Add 3½ lbs. (1.3kg) for General Purpose Sample Compartment

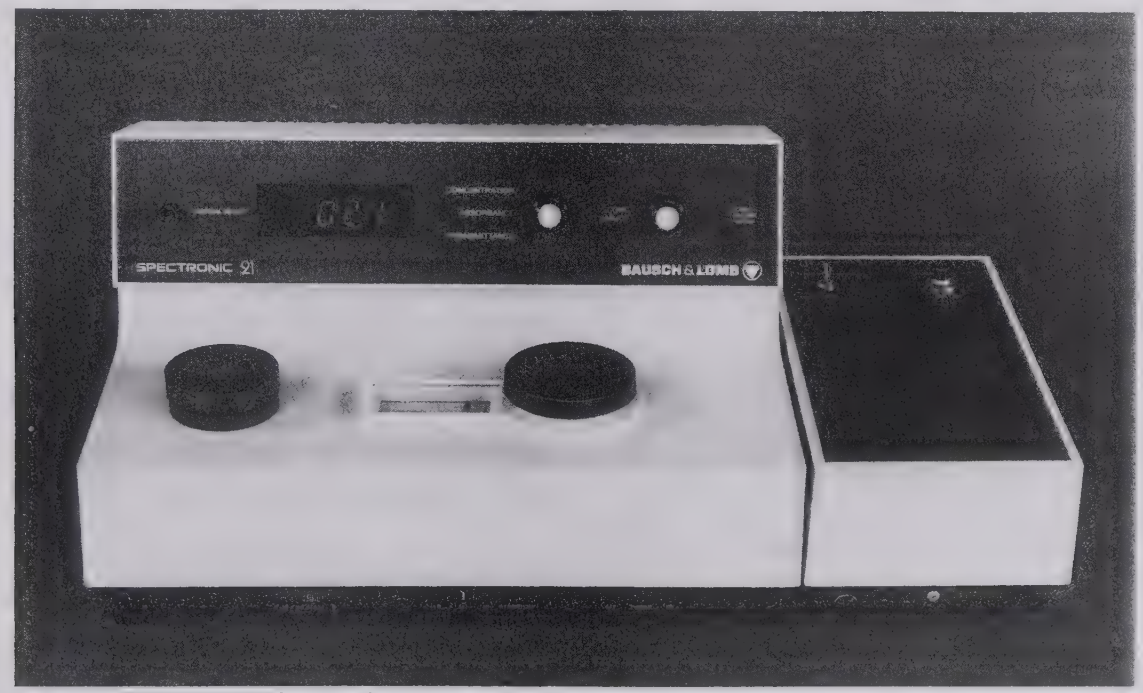


Figure 4. SPECTRONIC 21 UVD Spectrophotometer

1.4.4 SPECTRONIC 21 UVD Spectrophotometer, Cat. No. 33-22-26

WAVELENGTH RANGE

The UVD model, shown in Figure 4, has an external lamp house, containing both the tungsten and deuterium lamps which provide a wavelength range of 200-1000nm.

READOUT

The digital display allows the operator to easily and accurately read in any of three operating modes: transmittance, absorbance, or concentration. A three-position sensitivity switch allows the operator to select the desired instrument gain setting. For values outside the photometric range, the left-hand digit position will display a "⊔" for underrange or an "□" for overrange. To save time and eliminate calculation error, the concentration mode yields results directly in concentration units. A Factor-Set button provides an extra check on operating conditions in the concentration mode.

ACCESSORIES SUPPLIED

The instrument is supplied complete with:

1. Universal test tube holder
2. Spare tungsten lamp
3. One dozen 10mm pathlength test tubes
4. Operator's manual
5. Dust cover
6. Calibration screwdriver
7. Occluder block

SPECIFICATIONS

Wavelength Range	200-1000nm
Wavelength Accuracy	Better than 2nm
Wavelength Readability	1.0nm
Spectral Slitwidth	10nm
Stray Radiant Energy	Less than .3%T at 220nm
Photometric Readout	Digital display, selectable for linear transmittance (T), absorbance (A).

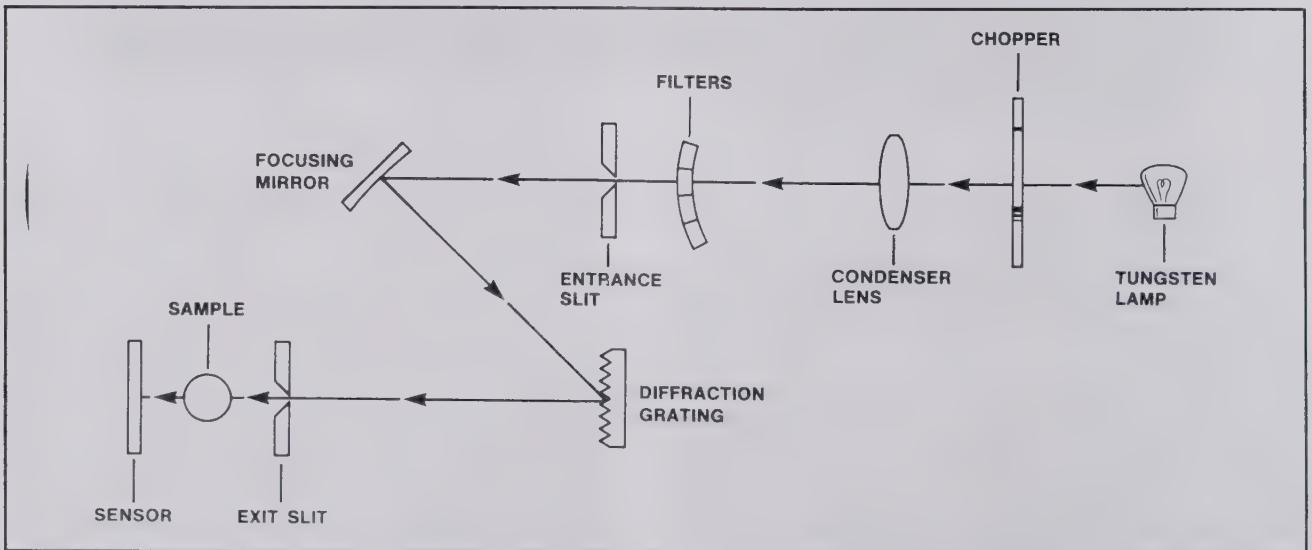
	or concentration (C), and A to C conversion factor
Photometric Range	00.0 - 100.0% in T .000 - 2.000 in A 000 - 2000 in C
Photometric Noise	Less than .1%T near 100%T .001A near 0.00A .002A near 1.00A
Photometric Linearity	Better than .2%T (.002A at .5A)
Long-term Drift	Less than .5%T per hour
Zero Drift	Less than .1%T per day
Accessory Output	Analog, >1 volt (adjustable) BCD, TTL Positive True Logic
Monochromator	Crossed Czerny-Turner
Dispersing Element	Reflection diffraction grating, 1200 lines/mm
Power Consumption	Tungsten lamp - 50 watts nominal Deuterium lamp - 70 watts nominal
Voltage Requirements	Selectable: 100V, 115V, 220V, 240V, 50/60 Hz
Size	20" W x 10½" D x 8½" H (50cm W x 26.7cm D x 21.6cm H) Add 5½" (14cm) to width for General Purpose Sample Compartment
Weight	22½ lbs. (8.4kg) Add 3½ lbs. (1.3kg) for General Purpose Sample Compartment.

1.5 OPTICAL SYSTEM

The optical system has been designed to provide a wide wavelength range, very low stray radiant energy, and a moderately narrow bandpass. The diagrams below show the optical system for the visible and UV/visible models.

In the visible models, as shown in Figure 5, white light from the tungsten lamp is chopped by a chopper fan blade. The chopped light is focused on the entrance slit of the monochromator by a fused silica condenser lens. Four filters, positioned near the entrance slit, are used to eliminate higher order wavelengths and reduce stray light to a very low level. The filters are automatically programmed to intercept the light beam at the proper wavelengths. After passing through the slit, the light is incident on a focusing mirror and then converges onto the diffraction grating. The grating disperses the light and a spectrum is formed in the plane of the exit slit. As the grating is rotated, different wavelengths (or colors) become incident on the slit. The exit slit isolates the selected narrow band of wavelengths. The exiting light then passes through the sample and is incident on the sensor. The sensor is a specially designed silicon chip which converts the light energy to an electrical signal for detection.

The UV/visible models, shown in Figure 6, have two lamps mounted in an exterior lamp house. Light from the proper lamp is selected by positioning the lamp interchange mirror to either pass the deuterium light or reflect the tungsten light. A silica relay lens system focuses the light near the chopper. As in the visible model, the light is chopped and focused by a condenser lens onto the entrance slit of the monochromator after passing through the appropriate filter. The monochromator is a more sophisticated design providing the higher quality optical characteristics required to cover the wider wavelength range. The optical arrangement employed is called a folded crossover Czerny-Turner configuration. After passing through the slit, the light is incident on a collimating mirror which collimates the light onto the diffraction grating. The grating disperses the light and a portion of the spectrum is picked up by the focusing mirror which focuses the light onto the exit slit. The folding mirror provides an optical system which is mechanically compatible with the visible system. The selected wavelengths then pass through the exit slit and sample. The light then is detected by the silicon sensor.



FOCUSING MIRROR | FILTERS | CHOPPER | SAMPLE | ENTRANCE SLIT | CONDENSER LENS | TUNGSTEN LAMP | DIFFRACTION GRATING | SENSOR | EXIT SLIT

Figure 5. Optical Diagram of the SPECTRONIC 21 DV & MV Spectrophotometers

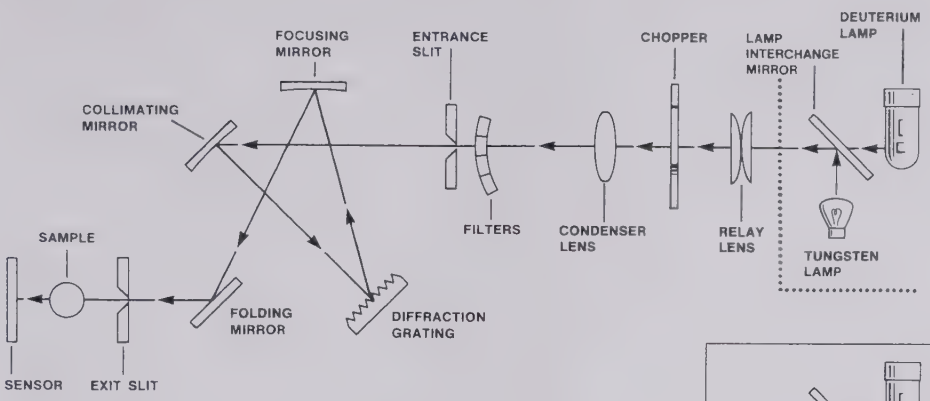
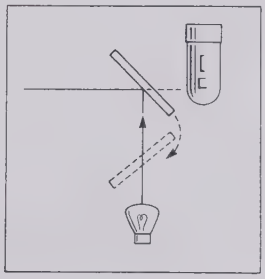


FIG. 5 - OPTICAL DIAGRAM OF THE SPECTRONIC® 21 MODELS UV-M AND UV-D SPECTROPHOTOMETERS



FOCUSING MIRROR | ENTRANCE SLIT | CHOPPER | LAMP INTERCHANGE MIRROR | DEUTERIUM LAMP | COLLIMATING MIRROR | SAMPLE | FILTERS | CONDENSER LENS

RELAY LENS | TUNGSTEN LAMP | FOLDING MIRROR | DIFFRACTION GRATING | SENSOR | EXIT SLIT

Figure 6. Optical Diagram of the SPECTRONIC 21 UVM and UVD Spectrophotometers

1.6 ELECTRONICS SYSTEM

Figures 7 and 8 below show the basic electronic system of the digital and meter models. The light beam is modulated by a chopper to produce a chopped DC signal. The modulated monochromatic radiation is imaged on the silicon sensor producing a current proportional to the intensity of light passing through the sample. The chopped DC signal is amplified further and then rectified to produce a DC level which is proportional to the percent transmittance or absorbance.

In the meter models (see Figure 7), the DC signal to be measured is sent to the meter and displayed in percent transmittance or absorbance. In the digital models, the DC signal is sent to the digital display to be measured and displayed. The DVM measures the DC voltage directly for percent transmitance mode of operation, or performs the log conversion for the absorbance and concentration modes of operation.

For the digital models (see Figure 8), the displayed value in T, A, or C is available in digital form at the BCD output plug at the rear of the instrument. Also, an adjustable linear output of percent T is available at the accessory output at the rear of all models. The digital models accept a D/A converter to provide linear output in absorbance, concentration, and transmittance.

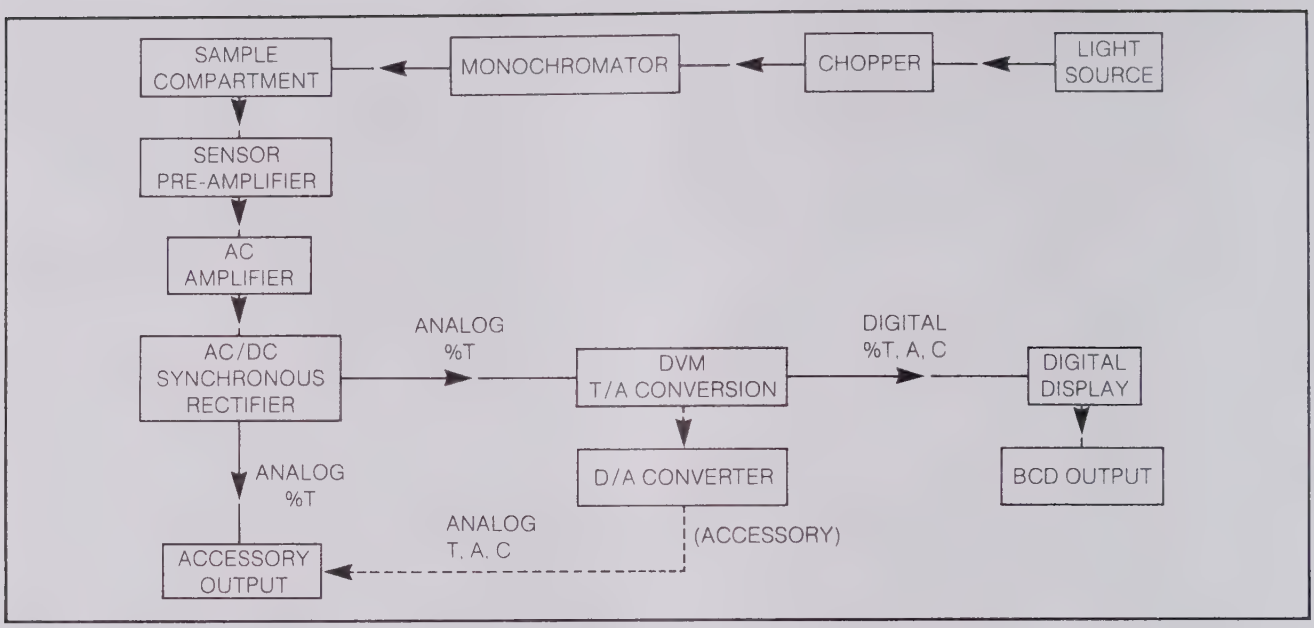


Figure 7. Electronic Diagram of the SPECTRONIC 21 Spectrophotometers, Models DV and UVD

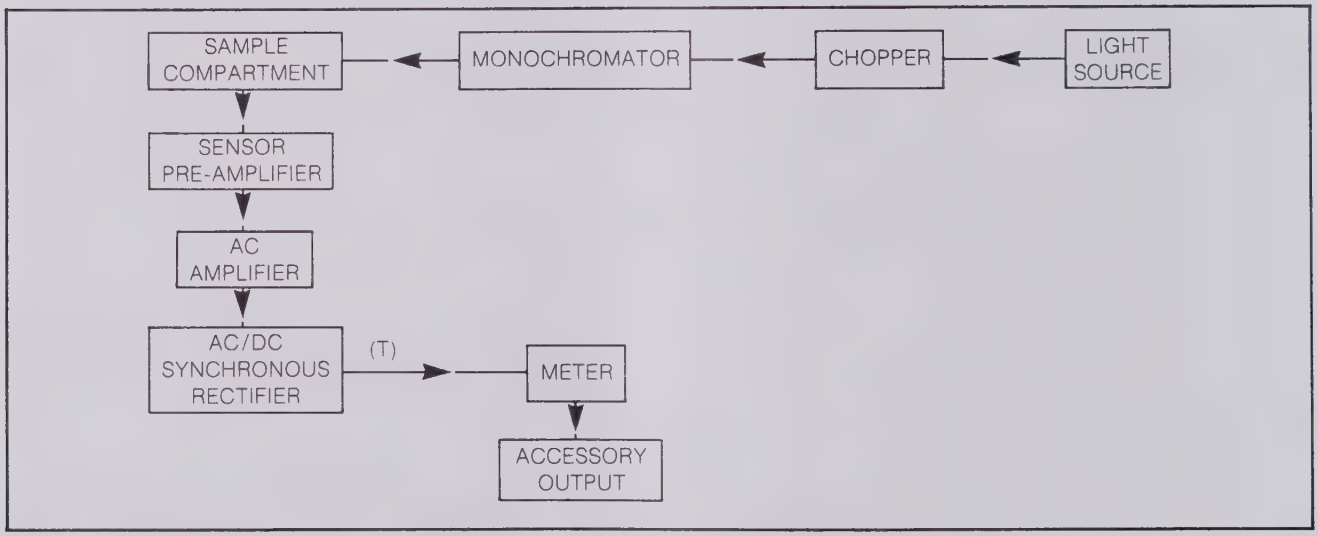


Figure 8. Electronic Diagram of the SPECTRONIC 21 Spectrophotometer, Model UVM

1.7 ELECTRONIC THEORY OF OPERATION

1.7.1 Analog Circuits

The analog circuits include all signal processing stages from the photodetector up to the input of the meter or DVM. Their overall function is to generate an AC signal from the chopped monochromatic radiation passing through the sample compartment, amplify it, and synchronously rectify the AC component to provide a DC signal proportional to the percent transmittance of the sample. Refer to schematics 332201-60002 and -60003.

The input stage contains a silicon photodiode, 2V1, which senses the chopped monochromatic radiation and generates an AC current proportional to the intensity of the incident radiation. Operational amplifier, 2U1, mounted directly on the sensor board provides the initial AC signal gain. The UV input and visible stages are identical, except that feedback resistor 2R4 is changed to provide greater gain in the UV stage and the photodiode is selected for high impedance and high sensitivity in the UV range. This compensates for the increased optical complexity in the UV instruments.

The amplified AC signal is fed from U1 on the sensor board via pin 4 of 14J1 to a "gain adjust" variable voltage divider network, used to set the readout to 100%T, or .000A. In the meter models, a 10-turn pot, 14R1, provides sufficient readout resolution. In the DVM models, additional divider resistors (14R1, 14R2) are used to provide increased resolution to 0.1%T or .001A.

The selected voltage level from the voltage divider network is fed via pin 1 of J1 to op-amp, U1, on the Amp/Detector board. U1 provides an AC signal voltage gain of X200, and the resultant AC output signal is capacitor-coupled to op-amp, U2, which operates as a synchronous rectifier under the control of FET Q2 and switching transistor, Q3. The output of U2 is thus a DC voltage proportional to the level of the AC input signal and is either read directly on the meter as %T or sent to the DVM circuit for further

processing and readout on the digital display.

The interaction of the synchronous detector circuit components is as follows:

The chopper blade periodically interrupts the sync lamp output, sensed by phototransistor, 6Q1, at a frequency of 240 Hz (with 60 Hz line power) or 200 Hz (with 50 Hz line power). The chopper blades are positioned to block (or pass) the source lamp and sync lamp outputs in-phase. When the sync lamp output is blocked by the chopper blade, 6Q1 is turned off, turning off Q3. When Q3 is off, FET Q2 is switched on, completing the U2 feedback loop through R9, and U2 passes the positive half-cycle of the AC input signal.

The C3-R9 filter converts the AC output to a DC analog voltage, and Q1, operating in its Zener mode, limits the DC level to 7 volts maximum. Note that the circuit provides signal rectification during the positive half-cycles of the AC signal for an optimum S/N ratio in the resultant DC analog signal.

For the meter models, the meter is connected into the feedback path of U2 to respond to the direct-current value of the rectified/filtered signal; for the DVM models, the DC analog signal is the voltage developed across R14 and 11R1 and is fed to the DVM circuits.

When the sync lamp output is passed by the chopper blade, 6Q1 is turned on. Q3 turns on switching Q2 off, which interrupts the feedback path for U2. This switching action occurs in synchronism with the negative half-cycles of the AC signal at U2, and the negative half-cycles of the AC signal at U2, and the negative half-cycles cannot develop a DC signal across the C3-R9 network. Since C3 will discharge through the accessory output voltage divider during this time, a nominal 15mv ripple is present on the "DVM analog out" pin.

NOTES

1. The "acc out" divider net R14 and 11R1 provides the required recorder output voltage (1 volt at 100%T) to match the accessory full-scale input requirement.
2. Zener diode Q1 holds the DC analog voltage level at 6-7 VDC maximum to prevent extreme overdrive of either the meter movement or the DVM circuits.
3. The chopper blade is driven by a synchronous motor to provide a constant speed and chopping frequency unaffected by normal line voltage fluctuations; a random variation in chopper frequency would appear as a drifting in the readout. The constant speed also maintains a constant flow of cooling air in the instrument, preventing shifts in component values due to thermal variations.

1.7.2 DVM Circuits

The SPECTRONIC 21 digital voltmeter (DVM) employs a "ramp" technique for analog-to-digital signal conversion. A comparator measures the value of the input analog voltage signal, in coincidence with the internally-generated ramp signal. When the ramp value equals the analog signal level, the comparator output changes logic state. During the time period that the ramp value is shifting from its resting value to the analog signal value, U7 is generating output pulses. These pulses are counted, and the accumulated count is related to the analog voltage being measured.

The DVM is unique since it generates a linear ramp for % transmittance measurements, and an exponential (logarithmic) ramp for absorbance and concentration measurements.

The DVM is divided into three functional blocks:

a. Analog - contains circuits associated with the ramp generation.

b. Digital - contains circuits for control and counting.

c. Display - contains circuits associated with the digital readout.

Refer to the DVM Schematic, drawing number 332201-60004.

DVM ANALOG SIGNAL PROCESSING

The analog input voltage is fed through J5-4 (Analog In) and S2, and is sensed by the operational amplifier U20 operating as a voltage follower. This stage has unity gain, therefore the voltage at the minus (inverting) input of the comparator, U19, is equal to the DVM analog input voltage. The ramp voltage is connected to the plus input of U19 and when the ramp voltage equals the input voltage, the output of U19 shifts its output level generating a RESET signal at U13-2. This signal stops the A-to-D conversion and updates the latches. The linear and exponential ramps are generated by C14 and other discrete components.

a. % Transmittance Conversion

The percent transmittance readout must be linear in relation to the analog input voltage, and hence an absolutely straight (linear) ramp must be generated. This is done by charging a 1.0 microfarad capacitor (C14) from the current source comprised of Q5 and its associated components. Since the capacitor charging current is held at a constant value, the voltage across the capacitor must be a linear ramp with time. This voltage is connected through the voltage follower U18 to the plus input of the comparator, U19.

In the steady state, prior to the START pulse, the CONV line is low and the N-CONV is high. Q7 is off, Q5 is off, and Q4 is on, discharging C14. This sets the ramp voltage at the plus input of U19 at very near 0.0VDC. When a positive voltage is present at the DVM analog input, there is a positive voltage at the inverting (minus) input of U19. As a result, the output of U19 is negative and is held by CR3 to 0.5 volts below ground. The RESET line is high, and when a START pulse is generated, the flip flop comprised of U13-3 and U17-3 is set. The CONV line goes high, turning on Q7 and Q5, and the N-CONV line goes low to turn off the Q4 discharging circuit across C14, allowing a linear ramp to be started. The voltage at the plus input of U19 begins to rise.

When this voltage is equal to the voltage at the minus input, U19's output goes high and enables the NAND-gate inverter U16. The output of U16 makes the RESET line go low, resetting the CONVERSION COMPLETE flip-flop. The N-CONV line goes high and the CONV line goes low, and a latch up-date is generated by the monostable multivibrator made up of U13-4 and U13-8 plus associated components. The up-date transfers and stores the counter information into the latches. The latched data is decoded and used to operate the necessary segments in the 7-segment displays to provide readout of the converted analog value which was originally presented to the DVM. Since the ramp voltage is linear, the count is linear in relation to the analog input voltage and the readout is presented in "% Transmittance."

b. Absorbance

(Note that there are four separate sections (A, B, C & D) on the 3-position mode switch S1.)

In the absorbance (and concentration) modes, an exponential (logarithmic) ramp must be generated. A large value of analog input signal must be displayed as a low value readout, i.e., 100%T must read as 0A and 10%T must read as 1.000A. The exponential ramp, therefore, must start at a high voltage and decrease in value. Prior to the start of a conversion, the N-CONV line is high, turning on Q2 and Q7. Q5 generates a constant current which flows to ground through a 2K ohm potentiometer (R29) and 9.09K fixed resistor (R33) connected in series with Q2. The voltage on C14 is then equal to the IR drop across the two resistors. The 2K pot controls the capacitor voltage and is used to make 100%T equal to 0A. The voltage on the capacitor must be larger than the voltage at the minus input of the U19 comparator before conversion starts, and with this condition, the U19 output is high. As a result, the RESET line is high before the conversion begins.

When the START pulse sets the CONVERSION COMPLETE flip-flop, the CONV line goes high and the N-CONV goes low turning off Q2, Q7, and Q5. Switch section S1-C disables conversion gates U16-8 and U16-6. Gate U17-6 is enabled by the CONV line and gate U17-6 in turn enables gate U17-8, turning on Q1. C14 then discharges through the 4.32K ohm 1% resistor (R26) creating an exponentially decreasing ramp which is related to the absorbance value of the original analog input signal. When the exponential ramp voltage at the plus input of the U19 comparator reaches the analog signal level at the minus input, the comparator output changes state (goes negative) setting the RESET line low. This resets the CONVERSION COMPLETE flip-flop and when the CONV line goes low the latch up-date pulse is generated.

c. Concentration

The operation in concentration is almost identical to operation in absorbance except that the capacitor discharge rate is adjusted by the Concentration Control. Switch section S1-C disables conversion gate U17-6 and enables gates U16-6 and U16-8.

When the START pulse sets the CONVERSION COMPLETE flip-flop and the CONV line goes high, gate U16-8 or U16-6 is selected depending on the state of the UNDERRANGE line. This line is normally high at the beginning of the conversion and goes low when the counters have counted to 000.

When the underrange line is high, conversion gate U16-8 is enabled, allowing conversion gate U17-8 to turn on Q1 which begins to discharge C14. The capacitor discharges via Q1 until the underrange line goes low. When it goes low, gate U16-8 is turned off and gate U16-6 and Q3 are turned on, thus discharging the capacitor through the variable resistance of the concentration control. The remainder of the conversion cycle is identical to that used in the absorbance mode.

DVM DIGITAL SIGNAL PROCESSING

The digital section primarily contains counters and latches. The DVM conversion begins when the 2 Hz oscillator, U6, generates a "START" pulse. The pulse's leading edge is differentiated by the C4, R4, and R5 network and squared off by inverter U11-2. This is a positive going, 2-microsecond pulse called START CONV, and sets counter U12 to zero (0), and counters U4, U2, and U14 to nine (9). At the same time, the pulse is inverted, resets the 1.5T latch U10-3 and U10-6, and sets the CC (Conversion Complete) flip-flop. When this flip-flop is set, the CONV line goes high, allowing clock pulses to be fed to counter U12. The output of U14 can have four states: UR, Null, 1000, and 2000.

a. UR - This is the underrange state. If less than 10 clock pulses are fed to counter U12 before the CC (Conversion Complete) latch is reset, the UR line remains high. This is then latched and decoded as an underrange signal.

b. Null - The Null state occurs when UR, 1000, and 2000 are low. During the time of the latch up-date, the zeros from the 1000, 2000 and underrange line are decoded by a Null Decode Gate U9-8 and fed back into latch U8-7. This is required so decoder U4 (located on the display board) can register a blank, and all segments are off in the most significant digit.

c. 1000 - The 1000 line, U14-9, goes high when 1000 or more clock pulses are entered into the counter. If the Conversion Complete flip-flop is reset after the 1000 or more counts, the 1000 line is fed to latch U8-3 and later decoded as "1" in the most significant digit on the DVM display.

d. 2000 - The 2000 line goes high if 2000 or more clock pulses are entered into the counter. When the line goes high, the 2000 latch gate U15-10 is enabled to prevent further count input into counter U14 and the 2000 line is latched in the high state. Latch U8-6 is held at the high level at the time of update, and later decoded as an overrange in the most significant digit on the DVM display. The 2000 latch is necessary to maintain the 2000 line high in the special case when more than 4000 clock pulses are fed to the counters under an extreme overrange condition.

The 1.5T latch circuit is comprised of U10-3, U10-6 and U9-12. U10-3 is reset by the inverted START CONV pulse and when the count reaches 1500, U10-6 is set. The least significant (right-hand) digit then always displays a zero (0) whenever the entire display has any value equal to or larger than 1500.

LATCH UPDATE

When the CONVERSION COMPLETE flip-flop is reset after the A-to-D conversion is completed, the CONV line goes low. The high-to-low transition is coupled into the latch update one-short multivibrator via the 150 picofarad capacitor C10. The latch update pulse is buffered by two inverters and drives the latches. The latch update pulse (at U11-4) is also available, off-board, for other interfaced operations.

DVM DIGITAL DISPLAY

Refer to Display Schematic, 332201-60005. The digital readout is operated in a routine manner. The BCD data is taken from the latches and decoded in the DD700 decoder-drivers U1, 2, 3, and 4. The three least significant digits are decoded normally and the decimal numbers related to the BCD data are displayed by the 7-segment planar gas-discharge readouts.

The operation of the most significant digit, however, is quite different. The 1000 line, 2000 line, UR line and the "blank" line are all connected to the DD700 decoder, and the operational logic is:

a. When the UR line is high, the display presents a "U" in the uppermost half of the most significant digit position,

indicating an underrange condition.

b. When the 2000 line is high, the display presents an "O" (letter) in the upper half of the most significant digit position, indicating an overrange condition.

c. If the 100, 2000, and UR lines remain low, the "blank" line goes high to prevent any readout in the most significant digit.

d. When the 1000 line is high, a "1" is displayed in this position.

Mode switch, section C, provides correct decimal point display for the absorbance and transmittance readouts.

1.7.3 D/A Converter Board (Accessory)

The D/A Converter board must be installed in the digital readout models if LINEAR analog output is desired in transmittance, absorbance, and concentration. It converts the digital signals generated by the instrument's DVM circuits.

The operation of the D/A Converter is similar to that of the analog portion of the DVM board in that a ramp technique is used.

At the start of a measurement, the N-CONV line goes low, turning Q3 off, causing Q1 to conduct. The conduction of Q1 allows the "sampling" ramp generator comprised of Q2, Q5, and R4 to charge C1 at a linear rate. The ramp voltage is buffered by U2 operating as a voltage follower. At the completion of the measurement, the N-CONV line goes high, which stops the ramp voltage from increasing and turns on Q6, charging C2 to the ramp value. This voltage is buffered by U1 and is brought out at pin 1 of connector J2, which connects to the analog output divider. The Resistor R13 serves as a "dummy" load for the amp detector board simulating the analog output divider.

At the start of the next measurement, the UR line goes high for approximately .1m sec, turning on Q4 and discharging C1. In the event that the display value is less than 0%T, or 000A (i.e., 99.9, .999) the UR line stays high and prevents C1 from charging. This will result in zero analog output.

1.7.4 Power Supplies

Unregulated supply transformer 16T1 contains a tapped primary winding and a voltage selector switch for operation on 100, 115, 220, or 240 VAC, 50/60 Hz.

The outputs are Zener regulated ± 15 VDC for the op-amps, and a combined lamp and DVM logic supply regulated by U3, a UA723 integrated-circuit voltage regulator. The required lamp voltage is + 5.85 to + 6.00 VDC and is controlled by the factory selection of R10. Under static condition, the voltage level at IC pins 4 and 5 are identical, and the output at IC pin 10 is + 6.7 VDC, which drives PASS transistor 17Q1.

Transistor 17Q1 carries the source lamp current. If the lamp voltage shifts away from its operating point, it will be sensed at pin 4 and the regulator will shift its output at pin 10. This shift in turn will modify the current flow through 17Q1 to return the lamp operating voltage to its desired operating level.

The + 5 VDC for the DVM logic circuits is derived by subtracting two diode-drops (17CR1 and 17Q2 base-emitter junction) from the lamp voltage.

NOTE

1. The source lamp and sync lamp are operated at a derated voltage for extended lamp life.
2. The required line fuse is automatically selected with the line voltage switch.

SECTION 2.
INSTALLATION

2.1 GENERAL

SPECTRONIC 21 spectrophotometers should be placed as far as possible from any strong magnetic or electrostatic fields or any high-frequency (RF) generation. They should be operated in a clean environment. Like all precision optical instrumentation, dust, smoke, and corrosive vapors must be avoided. Some organic solvent vapors absorb UV and can cause reduced sensitivity and increased signal noise.

2.2 LINE VOLTAGE ADAPTATION

All models of the SPECTRONIC 21 spectrophotometer can be operated on 100, 115, 220, or 240 VAC ± 10%, at 50/60 Hz ± 2 Hz. The line voltage selection switch is on the bottom of the instrument, as shown in Figure 9.

a. Disconnect the line cord.

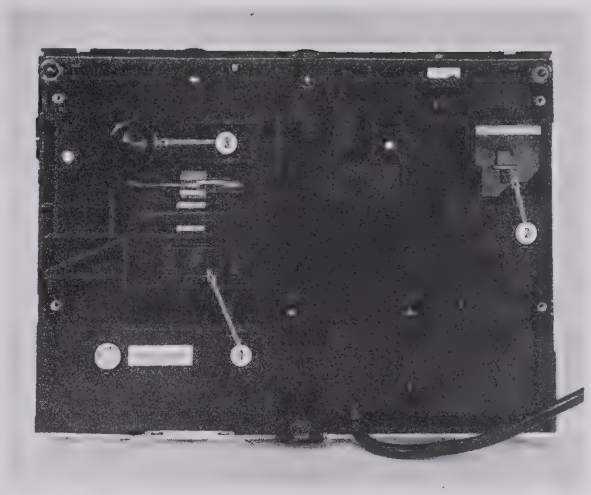
b. Tilt the instrument on its back.

c. Squeeze rounded section of switch protector cover to gain access to voltage selection switch.

d. Position switch at desired voltage. To ensure switch is in correct position, count detents from one end while moving switch.

e. Replace fuse with one of proper value.

f. Replace switch cover.



1. Voltage Selector Switch
2. Lamp Access Plate - DV Model (33-22-01) only
3. Sample Compartment Drain Cap

Figure 9. Bottom View

SECTION 3.
SERVICE

3.1 INTRODUCTION

This section contains service procedures for SPECTRONIC 21 spectrophotometers to enable qualified service technicians to isolate a malfunction to the component level. The procedures consist of an operational performance check to define the instrument's required capabilities and a troubleshooting chart to quickly define the probable source of various malfunctions. The performance check and troubleshooting are arranged in tabular format.

The troubleshooting charts are not intended to replace a skilled technician's logical analysis of the problem or the requisite understanding of the optical/electronic theory of operation.

After a malfunction has been corrected, a complete performance check should be made to ensure the overall performance level is acceptable.

3.2 PHYSICAL INSPECTION

Before starting instrument teardown for a reported malfunction, first check the operator's laboratory procedures to determine if the problem is caused by faulty analytical technique or if there is any discernible pattern to the problem. The service history of the instrument should then be reviewed, followed by a complete physical inspection.

Disconnect the line cord, remove the cover(s) and inspect for physical indications of the problem. Typical visual clues include loose printed circuit boards, components, or connectors, burned or overheated components, broken wires, foreign matter, dirty optics, etc.

3.3 PERFORMANCE CHECKLISTS WITH TROUBLESHOOTING CHARTS

3.3.1 Performance Checklist, Digital-visible (DV) Model, Cat. No. 33-22-01 or 33-22-41

PROCEDURE	NORMAL INDICATION
1. Turn on instrument and perform visual inspection.	Display digits light. (There may be an initial delay when instrument has not been used for a long period of time.) Fan operates and runs at constant speed. (Fan must not produce a slow, cyclical, "beat" sound.)
2. Insert occluder into sample compartment. Switch to %T mode. Switch through sensitivity settings.	Display should indicate 00.0%T ± .1%T at all sensitivity settings.
3. Remove occluder. Set instrument to 340nm. Set maximum gain. (High sensitivity, and %T adjust wheel full right.)	In the transmittance mode, the display should indicate an overrange condition (200%T or greater).
4. Operate the Mode Select switch.	The display decimal point must read as follows: %T XXX.X A X.XXX C XXXX
5. Set .5A on display. Switch to Concentration mode. Rotate Concentration Adjust knob to either extreme. Set OA and repeat.	With .5A set in the Absorbance mode, the extreme positions of the concentration adjust pot must produce a minimum value of 167 and maximum value of 2000 (□000) contration units. With OA set, the instrument should indicate O Concentration units.
6. Switch instrument to A mode. Depress the CONCENTRATION FACTOR button.	With button depressed, the display should indicate .100A ± .001 and be adjustable with trimpot on Amp-Detector board.
7. Set 100%T. Switch to A mode. Repeat for 50, 10 and 1%T.	Display indicates: 000.0A ± .001A @ 100%T .301A ± .002A @ 50%T 1.000A ± .004A @ 10%T 2.000A ± .040A @ 1%T
8. Find wavelength of peak instrument response (approximately 460nm). Set minimum gain.	Instrument display must indicate less than 100%T.
9. Check wavelength accuracy (Spectronic Standards or Cobalt Chloride Method).	Wavelength accuracy must be within ± 5.0nm.
10. Set 100%T at 590nm. Insert Photometric Performance Standard and record displayed %T values.	The standards should read their calibrated value within ± 0.4T.

3.3.2 Troubleshooting Chart, Digital-visible (DV) Model, Cat. No. 33-22-01 or 33-22-41

PROBLEM	PROBABLE CAUSE
1. Instrument dead	1. Line cord not connected or defective 2. Outlet dead 3. Blown fuse 4. Defective power switch
2. Fan on - No digits lit on display, or dimly lit	1. No high voltage 2. + or ± 15 volt supplies bad
3. No display response - Underrange in %T - Overrange in Absorbance - DVM RESPONDS TO CONCENTRATION FACTOR BUTTON	1. Defective lamp or lamp supply 2. Defective or dirty Sensor 3. Broken Sensor flex-circuit 4. Fan not operating 5. Obstruction in sample compartment or optical path 6. Defective phototransistor/Lamp Assembly 7. Defective Amp-Detector board
4. No display response - Underrange in %T - Overrange in Absorbance - DVM DOES NOT RESPOND TO CONCENTRATION FACTOR BUTTON	1. Defective + 5 and/or ± 15 volt supplies 2. DVM board malfunction
5. Noise or drift with no cell in sample compartment	1. Defective Sensor 2. Intermittent break in flex circuit 3. Source lamp defective or old 4. Defective lamp supply 5. Noisy 100%T pot 6. Defective fan motor (Check for constant speed. Fan motor should not "hunt" or "throb.") 7. Wrong line voltage setting 8. Excess line voltage variation 9. Cover not on properly 10. Environment (solvent vapors, smoke, etc.)
6. Low Energy (Can't set 100%T, OA)	1. Defective lamp 2. Dirt or optics fogged in monochromator 3. Defective or dirty Sensor 4. Defective grating 5. Optical alignment 6. Defective Amp-Detector board 7. Lamp not properly seated or bad connection

3.3.2 Troubleshooting Chart, Digital-visible (DV) Model (Continued)

PROBLEM	POSSIBLE CAUSE
7. Photometric Error	1. Optical alignment 2. Filter(s) loose or broken 3. Wavelength calibration 4. Analytical procedures 5. Electronic calibration 6. Defective Sensor 7. Light leaks at sample well
8. Display problem - missing or broken segment	1. Defective readout 2. Defective readout driver
9. Display problem - missing digit	1. Defective readout driver
10. Display problem - missing decimal point(s)	1. Defective readout 2. Defective IC on DVM board (U15) 3. Defective Component on Readout board
11. Can't set 00.0T	1. Light leak, e.g., sample compartment drain hole or port cover not closed 2. Electronic calibration 3. Defective Sensor
12. Incorrect T/A Correlation or Absorbance/Concentration Correlation problem	1. Electronic calibration 2. Defective DVM
13. Wavelength Drive Backlash (wavelength setting varies by more than ½ division when approached in opposite directions)	Use "Teflon" powder on grating mount balls, top and bottom.
14. Excessive torque on wavelength drive	Use "Teflon" powder on wavelength cam shaft.
15. Left-hand cover doesn't lock	Hinge not properly adjusted

3.3.3 Performance Checklist, Meter-visible (MV) Model, Cat. No. 33-22-02 or 33-22-42

PROCEDURE	NORMAL INDICATION
1. Turn on instrument and perform visual inspection.	Pilot lamp lights. Fan operates and runs at constant speed. (Fan must not produce a slow, cyclical, "beat" sound.)
2. Insert occluder into sample compartment.	Meter should indicate 0%T.
3. Remove occluder. Connect DVM to analog output. Check that 100%T = 1VDC, nominal. Set instrument to 340nm. Set maximum gain using tungsten lamp.	DVM should indicate at least: 2.0 VDC @ 340nm
4. Set minimum gain. Turn wavelength dial slowly from 340nm to 1000nm.	Instrument meter must indicate less than 100%T.
5. Check wavelength accuracy (Spectronic Standards or Cobalt Chloride Method).	Wavelength Accuracy must be within ± 5.0nm.
6. Set 100% at 590nm on meter. Insert Photometric Performance Standard and record 6. %T values.	The standards should read their calibrated values within ± 0.4%T.
7. Switch instrument to A mode. Depress the Concentration Factor button.	With button depressed, the display should indicate .100A ± .001 and be adjustable with trimpot on Amp-Detector board.
8. Set 100%T. Switch to A mode. Repeat for 50, 10 and 1%T.	Display indicates: 000.0A ± .001A @ 100%T .301A ± .002A @ 50%T 1.000A ± .004A @ 10%T 2.000A ± .040A @ 1%T
9. Find wavelength of peak instrument response (approximately 460nm). Set minimum gain.	Instrument Display must indicate less than 100%T.
10. Check wavelength accuracy (Spectronic Standards or Cobalt Chloride Method).	Wavelength accuracy must be within ± 2.5nm.
11. Set 100%T at 500nm. Insert neutral density filter and record displayed %T value. Repeat, setting 50%T and 25%T initially.	The filter reading at 50%T must equal ½ the reading at 100%T ± .2%T. The 25%T reading must equal ¼ the 100%T reading ± .2%T.

3.3.4 Troubleshooting Chart, Meter-visible (MV) Model, Cat. No. 33-22-02 or 33-22-42

PROBLEM	PROBABLE CAUSE
1. Instrument dead	1. Line cord not connected or defective 2. Outlet dead 3. Blown fuse 4. Defective power switch 5. Improper line voltage
2. No instrument response - pilot light on	1. Defective lamp 2. Defective or dirty Sensor 3. Broken Sensor flex-circuit 4. Obstruction in sample compartment or optical path 5. Defective sync detector 6. Fan not operating 7. Amp-Detector board malfunction 8. Defective meter
3. Noise or drift with no cell in Sample Compartment	1. Defective Sensor 2. Intermittent break in flex-circuit 3. Source lamp defective or old 4. Noisy 100%T pot 5. Defective fan motor (Check for constant speed. Fan motor should not "hunt" or "throb.") 6. Wrong line voltage setting 7. Excess line voltge variation 8. Defective meter or meter connections 9. Environment (vapors, smoke, etc.) 10. Cover improperly installed
4. Low Energy (can't set 100%T)	1. Defective lamp 2. Dirty or fogged optics in monochromator 3. Defective or dirty Sensor 4. Defective grating 5. Optical alignment 6. Environment (smoke, vapor, etc.) 7. Defective Amp-Detector board
5. Photometric Error	1. Optical alignment 2. Filter(s) loose or broken 3. Wavelength calibration 4. Analytical procedures 5. Electronic calibration 6. Defective Sensor 7. Light leaks at sample well
6. Zero %T off	1. Mechanical zero on meter not adjusted 2. Electronic calibration 3. Defective Sensor 4. Light leak, e.g., sample compartment drain hole or port cover not closed
7. Wavelength Drive Backlash (wavelength setting varies by more than ½ division when approached in opposite directions)	Use "Teflon" powder on grating mount balls, top and bottom.
8. Excessive torque on wavelength drive	Use "Teflon" powder on wavelength cam shaft.

3.3.5 Performance Checklist, UV-meter (UVM) Model, Cat. No. 33-22-25

PROCEDURE	NORMAL INDICATION
1. Turn on instrument and perform visual inspection.	Pilot lamp lights. Fan operates and runs at constant speed. (Fan must not produce a slow, cyclical, "beat" sound.)
2. Insert occluder into sample compartment.	Meter should indicate 0%T.
3. Remove occluder. Connect DVM to analog output. Check that 100%T = 1VDC, nominal. Set instrument to 350nm. Set maximum gain using Tungsten lamp. Repeat @ 220nm with D2 lamp.	DVM should indicate at least: 1.5 VDC @ 350nm with Tungsten lamp. 2.000 VDC @ 220nm with D2 lamp.
4. Set minimum gain. Turn wavelength dial slowly from 200nm to 1000nm. (Use D2 lamp from 200nm to 360nm. Use Tungsten lamp from 360nm to 1000nm.)	Instrument meter must indicate less than 100%T.
5. Check wavelength accuracy (Spectronic Standards or Cobalt Chloride Method).	Wavelength Accuracy must be within ± 2.5nm.
6. Set 100% at 500nm on meter. Insert Photometric Performance Standard and record 6. %T value. Repeat, setting 50%T and 25%T.	The filter reading at 50%T must equal ½ the value of the filter reading at 100%T ± 1%. The reading obtained at 25%T must be ¼ the 100%T reading ± 1%.

3.3.6 Troubleshooting Chart, UV-meter (UVM) Model, Cat. No. 33-22-25

PROBLEM	PROBABLE CAUSE
1. Instrument dead	1. Line cord not connected, or defective 2. Outlet dead 3. Blown fuse 4. Defective power switch 5. Improper line voltage
2. No instrument response - pilot light on	1. Defective lamp or lamp supply 2. Defective or dirty Sensor 3. Broken Sensor flex-circuit 4. Obstruction in sample compartment or optical path 5. Defective phototransistor or lamp assembly 6. Fan not operating 7. Mirror interchange lever in wrong position for lamp used 8. Amp-Detector board malfunction 9. Defective meter 10. Lamps not adjusted - Refer to lamp alignment procedure
3. Noise or drift with no cell in Sample Compartment	1. Defective Sensor 2. Intermittent break in flex-circuit 3. Source lamp defective or old 4. Noisy lamp supply 5. Noisy 100%T pot 6. Defective fan motor (Check for constant speed. Fan motor should not "hunt" or "throb.") 7. Wrong line voltage setting 8. Excess line voltge variation 9. Defective meter or meter connections 10. Lamp(s) not aligned (peaked) 11. Environment (vapors, smoke, etc.) 12. Cover improperly installed

3.3.6 Troubleshooting Chart, UV-meter (UVM) Model (Continued)

PROBLEM	POSSIBLE CAUSE
4. Low Energy (can't set 100%T)	1. Defective lamp 2. Dirty or fogged optics in monochromator 3. Defective or dirty Sensor 4. Defective grating 5. Optical alignment 6. Lamp(s) not aligned (peaked) or bad 7. Environment (smoke, vapor, etc.) 8. Defective Amp-Detector board
5. Photometric Error	1. Optical alignment 2. Filter(s) loose or broken 3. Wavelength calibration 4. Analytical procedures 5. Electronic calibration 6. Defective Sensor 7. Light leaks at sample well
6. Zero %T off	1. Mechanical zero on meter not adjusted 2. Electronic calibration 3. Defective Sensor 4. Light leak, e.g., sample compartment drain hole or port cover not closed
7. Wavelength Drive Backlash (wavelength setting varies by more than ½ division when approached in opposite directions)	Use "Teflon" powder on grating mount balls, top and bottom.
8. Excessive torque on wavelength drive	Use "Teflon" powder on wavelength cam shaft.
9. Left-hand cover doesn't lock	Hinge not properly adjusted.

3.3.7 Performance Checklist, UV-digital (UVD) Model, Cat. No. 33-22-26

PROCEDURE	NORMAL INDICATION
1. Turn on instrument and perform visual inspection.	Display digits light. (There may be an initial delay when instrument has not been used for a long priod of time.) Fan operates and runs at constant speed. (Fan must not produce a slow, cyclical, "beat" sound.)
2. Insert occluder into sample compartment. Switch to %T mode. Switch through sensitivity settings.	Meter should indicate 00.0%T ± .1%T at all sensitivity settings.
3. Remove occluder. Set instrument to 350nm. Set maximum gain (High sensitivity and %T adj. wheel full right) using Tungsten lamp. Repeat @ 220nm with D2 lamp.	Display should indicate at least: 150%T @ 350nm with Tungsten lamp. 200%T @ 220nm with D2 lamp.
4. Set minimum gain. Turn wavelength dial slowly from 200nm to 1000nm. (Use D2 lamp from 200nm to 360nm. Use Tungsten lamp from 360nm to 1000nm.)	Instrument display must indicate 100%T, maximum.
5. Set .5A on display. Switch to Concentration mode. Rotate Concentration Adjust Knob to either extreme. Set OA and repeat.	With .5A set in the Absorbance mode, the extreme positions of the concentration adjust pot must produce a minimum value of 167 and a maximum value of 2000 (000) concentration units. With OA set, the instrument should indicate O Concentration units.
6. Switch instrument to A mode. Depress the Concentration Factor button.	With button depressed, the display should indicate .100A ± .001 and be adjustable with trimpot on Amp-detector board.
7. Set 100%T. Switch to A mode. Repeat for 50, 10 and 1%T.	Display indicates: 000.0A ± .001A @ 100%T .301A ± .002A @ 50%T 1.000A ± .004A @ 10%T 2.000A ± .0040 @ 1%T
8. Check wavelength accuracy (use Spectronic Standards).	Wavelength accuracy must be within ± 5.0nm.
9. Set 100%T at 590nm.	The filters should read their calibrated values ± 0.04%T.

3.3.8 Troubleshooting Chart, UV-digital (UVD) Model, Cat. No. 33-22-26

PROBLEM	PROBABLE CAUSE
1. Instrument dead	1. Line cord not connected or defective 2. Outlet dead 3. Blown fuse 4. Defective power switch
2. Fan on - No digits lit on display or dimly lit	1. No high voltage 2. + 5 or ± 15 volt supplies bad
3. No display response - Underrange in %T - Overrange in Absorbance - DVM RESPONDS TO CONCENTRATION FACTOR SET BUTTON	1. Defective lamp or lamp supply 2. Defective or dirty Sensor 3. Broken Sensor flex-circuit 4. Fan not operating 5. Obstruction in sample compartment or optical path 6. Defective phototransistor/Lamp Assembly 7. Mirror interchange lever in wrong position for lamp being used 8. Defective Amp-Detector board
4. No display response - Underrange in %T - Overrange in Absorbance - DVM DOES NOT RESPOND TO CONCENTRATION FACTOR SET BUTTON	1. Defective + 5 and/or ± 15 volt supplies 2. DVM board malfunction
5. Noise or drift with no cell in Sample Compartment	1. Defective Sensor 2. Intermittent break in flex circuit 3. Source lamp defective or old 4. Defective lamp supply 5. Noisy 100%T pot 6. Defective fan motor (Check for constant speed. Fan motor should not "hunt" or "throb.") 7. Wrong line voltage setting 8. Excess line voltage variation 9. Lamp not aligned (peaked) for maximum output 10. Cover improperly installed 11. Environment (vapors, smoke, etc.)
6. Low Energy (can't set 100%T, 0A)	1. Defective lamp 2. Dirt or optics fogged in monochromator 3. Defective or dirty Sensor 4. Defective grating 5. Optical alignment 6. Lamp not aligned (peaked) for maximum output or bad connection 7. Defective Amp-Detector board

3.3.8 Troubleshooting Chart, UV-digital (UVD) Model (Continued)

PROBLEM	POSSIBLE CAUSE
7. Photometric Error	1. Optical alignment 2. Filter(s) loose or broken 3. Wavelength calibration 4. Analytical procedures 5. Electronic calibration 6. Defective Sensor 7. Light leaks at sample well
8. Display problem - missing or broken segment	1. Defective readout 2. Defective readout driver
9. Display problem - missing digit	1. Defective readout driver
10. Display problem - missing decimal point(s)	1. Defective readout 2. Defective IC on DVM board (U15) 3. Defective component on readout board
11. Can't set 00.0T	1. Light leak, e.g., sample compartment 2. Electronic calibration 3. Defective Sensor
12. Incorrect T/A Correlation or Absorbance/Concentration Correlation problem	1. Electronic calibration 2. Defective DVM
13. Wavelength Drive Backlash (wavelength setting varies by more than ½ division when approached in opposite directions)	Use "Teflon" powder on grating mount balls, top and bottom.
14. Excessive torque on wavelength drive	Use "Teflon" powder on wavelength cam shaft.
15. Left-hand cover doesn't lock	Hinge not properly adjusted.

3.4 SERVICE EQUIPMENT AND TOOLS

a. Oscilloscope, Tektronix 502 or equivalent with X1 probe

b. DVM, 3½ digit display with 0.1 millivolt resolution

c. Monochromator Alignment took, SP21-M-147229

d. Wavelength Calibration Filter suitable for 10nm spectral slit width, Cat. No. 33-31-57

e. Watch-Crystal Cement

f. "Teflon" powder

g. Louver Adhesive (5-minute epoxy)

3.5 RECOMMENDED SERVICE SPARE PARTS

B&L Part No.	Description	B&L Part No.	Description
332201-223	Sync Detector Assembly	33-22-24	Visible Sensor Board Assembly (Detector Board)
332201-6164	Amp-Detector PW Board	332225-6024	Power Supply PW Board
332201-6084	Display PW Board	332225-6054	Flex Circuit Assembly
332201-6094	DVM PW Board	332226-641	Transformer Assembly
332201-6144	Flex Circuit Assembly	332959-710	Transistor (Special)
332201-1000	Display Module, Sperry SP-352	333060-700	Transistor, 2N5068
33-22-23	UV Sensor Board Assembly (Detector Board)	33-33-07	Tungsten Lamp Assembly
		34-34-24	Deuterium Lamp Assembly

SECTION 4.
MAINTENANCE

4.1 INTRODUCTION

This section contains removal, replacement, adjustment, and complete field alignment procedures (optical and electronic) for all models of the SPECTRONIC 21 spectrophotometer.

4.2 FUSE REPLACEMENT

Before replacing an open fuse, try to determine the location of the circuit overload and correct the fault. Use ONLY the fuses listed - do not overfuse the instrument.

WARNING

Disconnect the line cord before proceeding.

a. Remove the instrument cover.

b. The fuse holder is on the rear of the base assembly. Install a replacement fuse with the correct rating.

Models 33-22-01, -02, -41, -42

Line Voltage	Fuse Size	B&L Part No.
100, 115VAC	2A Slo-Blo	332879-101
220, 240VAC	0.7A Slo-Blo	333172-707

Models 33-22-26, -26, -43

Line Voltage	Fuse Size	B&L Part No.
100, 115VAC	2.5A Slo-Blo	332225-277
220, 240VAC	1.25A Slo-Blo	333083-737

c. Temporarily connect the line cord and check for proper operation. Perform service if required.

d. Disconnect the line cord and replace cover.

4.3 LAMP REPLACEMENT

4.3.1 Digital-visible Model, Cat. No. 33-22-01/33-22-41 and Meter-visible Model, Cat. No. 33-22-02/33-22-42.

1. Turn off and unplug instrument.
2. Tilt instrument up for access to the bottom.
3. Remove lamp access plate (see Figure 10) on the bottom of the instrument by pulling up locking peg and pulling off cover. A screwdriver may be required to pry peg back if it is too tight.
4. Grasping the lamp mount tab, remove used lamp mounting board by lifting and pulling, guiding edges through slots.
5. Be sure new lamp envelope is clean and avoid touching it. Insert new lamp mounting board by grasping tab, bulb facing rear of instrument, and inserting board in aligning slots and up into socket. Push board in as far as possible and then pull back slightly until board butts against aligning wall.
6. Replace lamp access plate and secure with locking peg inserted through both door and printed circuit board tab, making sure the end of locking peg goes through both tabs.

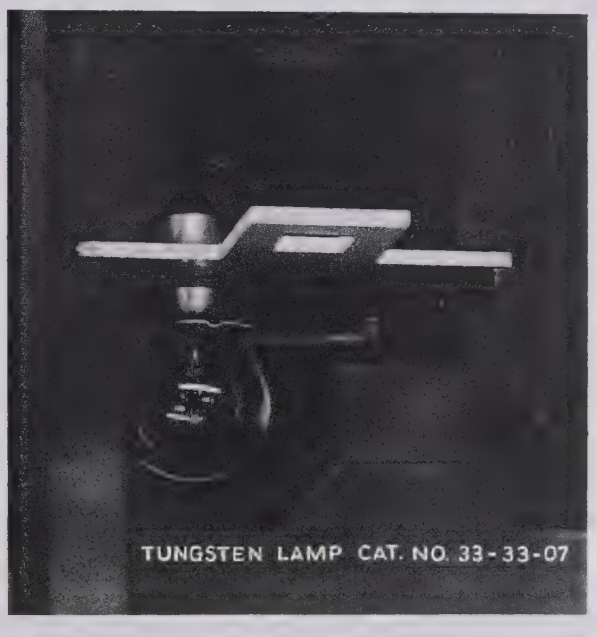


Figure 10. Tungsten Lamp Assembly

4.3.2 UVM Model, Cat. No. 33-22-25 and UVD Model, Cat. Nos. 33-22-26 or 33-22-43

CAUTION

High voltage is present in the lamp house. Unplug instrument before replacing lamps.

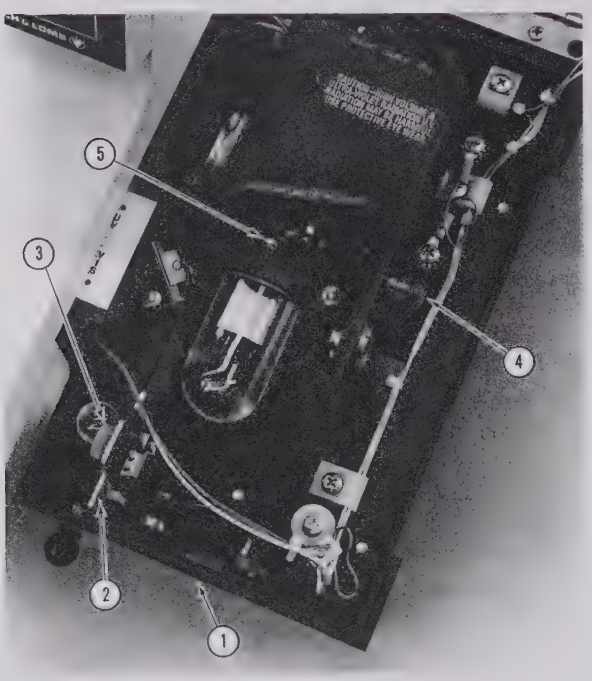
TUNGSTEN LAMP, CAT. NO. 33-33-07

1. Turn off and unplug the instrument.
2. Loosen clamping screw (shown in Figure 11) on the front base of lamp house cover two full turns and open cover.
3. Unscrew knurled thumbscrew to release lamp board from adjusting bracket.
4. Unplug lamp board base from white plastic socket.
5. Plug new lamp into white plastic socket. Be sure lamp envelope is clean and avoid touching it.
6. Place lamp board against adjusting bracket, making sure the two aligning posts on the adjusting bracket extend through the holes provided on the lamp board.
7. Replace and tighten knurled thumbscrew.
8. Be sure lamp is properly aligned (see Instrument Maintenance - Lamp Alignment) and completely free of dust and fingerprints.
9. Close lamp house cover and tighten clamping screw.

DEUTERIUM LAMP, CAT. NO. 34-34-24

CAUTION

Turn off and unplug the instrument.



1. Clamping Screw
2. Plastic Socket - Tungsten Lamp
3. Knurled Thumbscrew - Tungsten Lamp
4. Knurled Thumbscrew - Deuterium Lamp
5. Lamp Collar Screws

Figure 11. Lamp Housing and Assembly - Models UVM and UVD

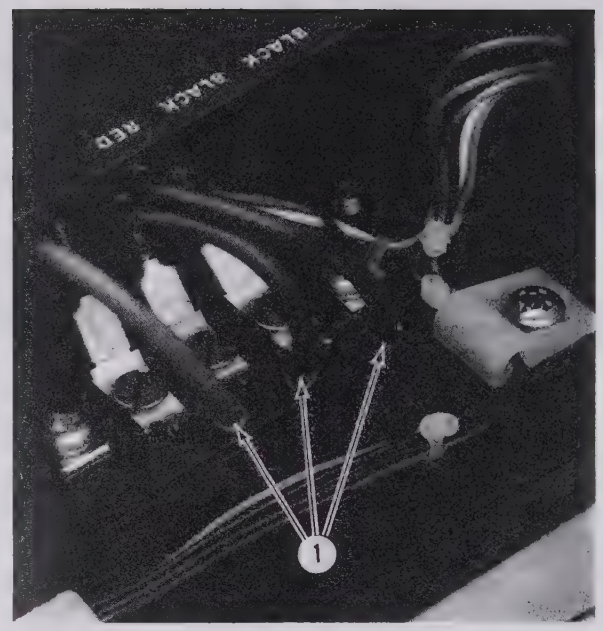


Figure 12. Deuterium Lamp Space Lug Connectors

1. Loosen clamping screw on the front base of the lamp house cover two full turns and open cover.
2. Pull lamp wires off spade connectors (shown in Figure 12) located behind lamp mounting plate.
3. Unscrew knurled thumbscrew to release lamp mounting plate from adjusting bracket and lift out lamp bracket assembly.
4. Unscrew lamp collar screws to remove lamp assembly from mounting plate.
5. Place new lamp assembly on lamp mounting plate and secure with lamp collar screws.

CAUTION

Do not touch lamp envelope. Any fingerprints on lamp should be removed before ignition of the lamp or they will be baked on.

6. Place lamp mounting plate against adjusting bracket, making sure the bottom aligning post is in the slot, and the top aligning post is through the hole provided on the mounting plate.
7. Replace and tighten knurled thumbscrew.
8. Place lamp wires over spade connectors located behind mounting plate, matching colors as indicated on label.
9. Be sure lamp is properly aligned (see Instrument Maintenance - Lamp Alignment) and completely free of dust and fingerprints.
10. Close lamp house cover and tighten clamping screw.

4.4 LAMP ALIGNMENT

UVM MODEL, CAT. NO. 33-22-25 AND
UVD MODEL, CAT. NO. 33-22-26

Proper lamp alignment ensures optimum performance of the instrument by accurately centering lamp radiation on the entrance slit of the monochromator. The lamp alignment procedure must always be done when the lamp assembly is replaced, and should also be checked in cases of reduced lamp energy or excess noise.

NOTE

The lamp in the DV model, Cat. No. 33-22-01 or 33-22-41, is self-aligning and requires no special adjustment.

WARNING

There are dangerous high voltages within this equipment in the area of the deuterium lamp. When the lamp house cover is removed, utmost care should be used in this procedure since the power must remain on.

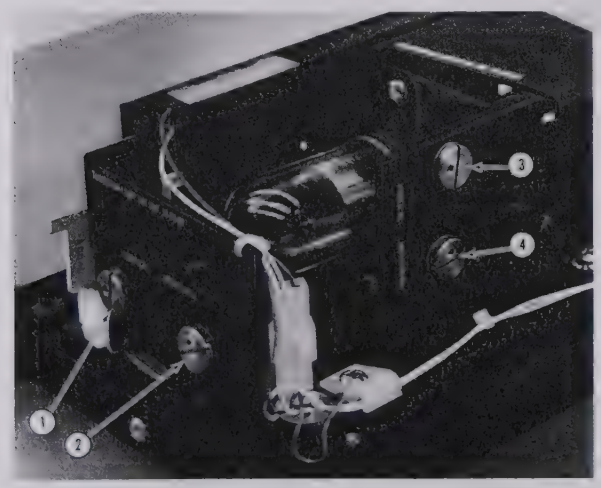
CAUTION

Use safety glasses. Do not look directly at the deuterium lamp during operation.

TUNGSTEN LAMP ALIGNMENT

1. Turn instrument on.
2. Set lamp power switch to Tungsten-VIS.
3. Push mirror lever all the way in for the visible range.
4. Loosen clamping screw on the front base of the lamp house cover two full turns and open cover.
5. Using the wavelength selector, set wavelength to 450nm.
6. For the UVD model (Cat. No. 33-22-26 or 33-22-43), set mode selector to percent transmittance.
7. Close sample compartment covers.
8. Rotate 100%T/zero A control to set a convenient transmittance reading around 50%T.
9. Using the eccentric screws (see Figure 13), on the tungsten lamp adjusting bracket, adjust the position of the lamp to obtain a maximum transmittance reading as follows:

   By turning the left screw, move the lamp assembly vertically to obtain a maximum transmittance readout.
10. Repeat left and right screw adjustments until a maximum transmittance value is obtained. It may be necessary during this procedure to adjust the 100%T/zero A control (Step 8) to reset a convenient, observable transmittance reading.
11. Close lamp house cover and tighten clamping screw.



1. Tungsten Lamp - Vertical Adjust
2. Tungsten Lamp - Horizontal Adjust
3. Deuterium Lamp - Vertical Adjust
4. Deuterium Lamp - Horizontal Adjust

Figure 13. Lamp Housing and Alignment - Models UVM and UVD

DEUTERIUM LAMP ALIGNMENT

1. Turn instrument on.
2. Set lamp power switch to Deuterium-UV.
3. Ignite the deuterium lamp by depressing starter button for approximately two seconds.

CAUTION

Avoid looking directly at deuterium lamp. Use safety glasses.

4. Set mirror lever to UV position.
5. Loosen clamping screw on the front base of lamp house cover two full turns and open cover.
6. Using the wavelength selector, set wavelength to 240nm.
7. For the UVD model, Cat. No. 33-22-26 (or 33-22-43), set mode selector to percent transmittance.
8. Close sample compartment covers.
9. Rotate 100%T/zero A control to set a convenient transmittance reading around 50%T.
10. Using the eccentric screws on the deuterium lamp adjusting bracket, adjust the position of the lamp to obtain a maximum transmitance value as follows:
    a. Adjust screws to the position shown in Figure 12.
    b. By turning the upper screw, move the lamp assembly vertically to obtain a maximum transmittance readout.
    c. By turning the lower screw, move the lamp assembly horizontally to obtain a maximum transmittance readout.
11. Repeat upper and lower screw adjustments until a maximum transmittance value is obtained. It may be necessary during the procedure to adjust the 100%T/zero A control (Step 9) to reset a convenient, observable transmittance reading.
12. Close lamp house cover and tighten clamping screw.

4.5 DETECTOR MAINTENANCE (ALL MODELS)

Low energy, the inability to set 100%T or zero A, may indicate the need for cleaning or replacing the detector.

1. Turn off and unplug instrument.
2. Tilt instrument back for access to bottom.
3. Remove detector access plate (see Figure 14) by removing holding screw and lifting tab on left.
4. Grasp detector mounting board and pull out through aligning slots. If pliers are used, pull directly below the socket and only contact mounting board on the very edge to avoid damaging metal runs or components.
5. Inspect the silicon chip for dirt and fingerprints. If necessary, clean gently with a cotton swab which has been dipped in methyl alcohol.
6. Reinsert cleaned detector or insert a new detector by grasping mounting board and inserting through aligning slot. Be sure the silicon detector faces toward light source and that white plastic terminal properly engages the connectors located in the instrument.
7. Replace detector access plate and secure with screw.

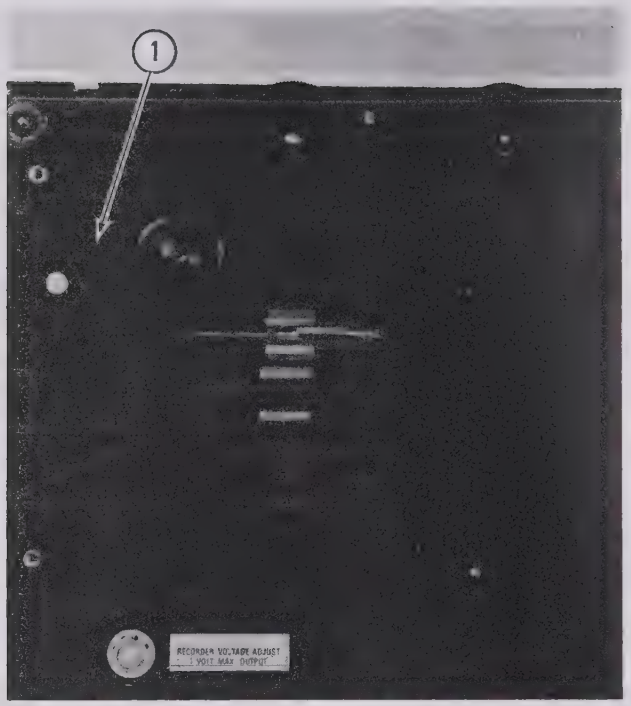


Figure 14. Position of Detector Access Plate

4.6 SAMPLE HOLDER MAINTENANCE

Cleaning of cuvettes both inside and out is important not only because any contamination material may absorb light, but also because material within the cell may chemically react with subsequent reagents or standards introduced into the cuvette. Cleaning methods depend to some extent on the nature of the contaminating material. Sodium (or ammonium) hydroxide or dilute hydrochloric acid may be used to remove some acidic and basic contaminants, respectively. Household bleach (undiluted or 1:1) very effectively removes proteinaceous and bacteral contaminants. Soaking in chromic acid* will remove most types of contaminants, but the acid should be handled and disposed of with care. Because of the exothermic reaction of the acid and water, any heat generated should be quickly dissipated to avoid alteration in the pathlength of the cuvette. Cuvettes should not be placed in hot chromic acid.

* To prepare chromic acid cleaning solution, slowly add (with stirring) 800ml of concentrated sulfuric acid to 458ml of distilled water containing 92g of sodium dichromate ($Na_2Cr_2O_7.2H_2O$). This cleaning solution should be red-brown. Discard when green tinge appears.

Cuvettes with scratches in the optical path should be discarded because scratches will cause anomalous absorbance readings. Round test tube cuvettes should be protected during cleaning and never thrown into a bath with other test tubes where they might scratch each other, or stood in a wire rack that might scratch their faces. The outside of the cuvettes may be wiped with a soft tissue and should be kept free of fingerprints.

4.7 WAVELENGTH CALIBRATION (ALL MODELS)

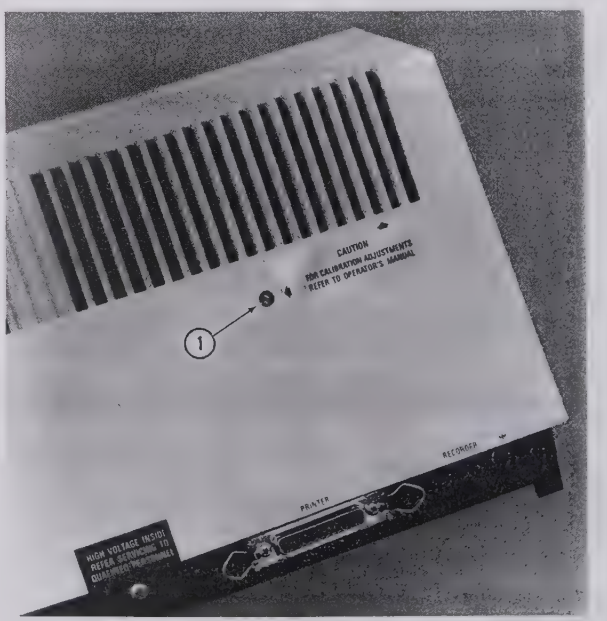
CAUTION

Disconnect line cord before removing cover.

1. Remove cover assembly. Turn instrument on and allow a few minutes warm-up.
2. Use a Wavelength calibration standard.
3. Insert the filter into the sample compartment and cover with a black cloth. Carefully rotate the Wavelength Control to the value of the filter to obtain a peak readout. (On the UV meter model, an external DVM can be connected to the "Accessory Output" for greater accuracy.) Note the wavelength at peak readout.
4. Rotate the Wavelength Control in the reverse direction toward the filter value and again note the wavelength at peak readout. The wavelength difference (backlash) between the peak readings in Steps #3 and #4 must not exceed ½ division on the Wavelength Scale, i.e., 1.0nm.
5. If the backlash is excessive, refer to the Monochromator Disassembly procedure and apply "Teflon" powder to the top and bottom bearings of the grating mount. Retest for backlash before proceeding with the calibration.
6. Set the instrument to a peak readout and compare the wavelength setting to the wavelength value of the calibration filter. It must be ± 2.5nm of the filter value.
7. If the error exceeds the ± 2.5nm tolerance, calibrate with the hex-head setscrew on the grating assembly.

   Turn the screw CLOCKWISE to LOWER the measured wavelength.

   Turn the screw COUNTERCLOCKWISE to RAISE the measured wavelength.
8. When complete, replace cover and knobs and recheck overall instrument performance.



1. Calibration Porthold

Figure 15. Rear View

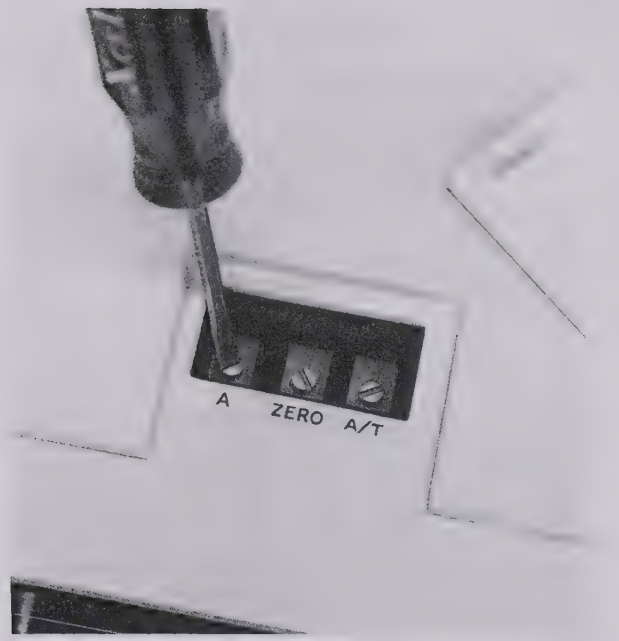


Figure 16. Calibration Potentiometers on top of Instrument Control Panel

4.8 ELECTRONIC CALIBRATION

All models are calibrated before shipping. However, due to extreme conditions encountered in shipping, they may require recalibration. The adjustments described in this section are extremely sensitive and must be performed carefully. Electronic calibration will need to be performed only infrequently and is not a daily or routine adjustment.

NOTE

Before performing any electronic adjustments, allow the instrument to warm up a minimum of one hour. Use the tungsten lamp with a wavelength setting of 500nm, and push in the mirror lever on the UVD model, cat. No. 33-22-26, and UVM model, Cat, No, 33-22-25.

The occluder block and calibration screwdriver are located in clips located on the bottom of each instrument.

4.8.1 Infinite Absorbance Calibration (all models)

1. Occlude the tungsten light by placing occluder block (Cat. No. 332201-316) in the sample holder and closing sample compartment lid.
2. Switch mode selector to absorbance.
3. Turn sensitivity selector to low and 100%T/zero A adjust to the lowest gain position (full left).
4. Insert the small calibration screwdriver through the porthole at the rear of the instrument (see Figure 15).

   a. (Digital Models, Cat. Nos. 33-22-01 and 33-22-26)

   Turn the potentiometer until the digital readout is 1.900 or lower. Then turn the potentiometer in the opposite direction until the digital readout goes overrange (□). Continue until the digits "lock up;" that is, until the reading suddenly stops changing. Reverse the rotation of the potentiometer just until the numbers begin to change again. The point of adjustment where the digits are on the verge of being "locked up" is the correct adjustment.

   b. (Meter Models, Cat. Nos. 33-22-02, 33-22-42, and 33-22-25)

   Turn the potentiometer until the meter reads exactly 0%T (∞A).

4.8.2 0%T Calibration (Digital Models Only, Cat. Nos. 33-22-01 and 33-22-26)

5. Switch mode selector to transmitance (the occluder must be in the sample compartment).
6. Snap out the plastic protector on the top of the instrument control panel to expose the three calibration potentiometers.
7. Using the calibration screwdriver, adjust the "zero" potentiometer (middle) until the digital readout is 00.0. There is a small range of settings where a reading of 00.0 will be obtained. The correct setting is the midpoint of this range.

4.8.3 Set Absorbance Calibration (Digital Models Only, Cat. Nos. 33-22-01 and 33-22-26)

8. Connect external DVM-to-Analog output terminals. Record the 0%T offset to the nearest 0.1 millivolt, and the polarity (+ or -) of offset.
9. Remove occluder from sample compartment, close lid.
10. Set Mode Selector to Absorbance. Adjust 100%T/Zero A Knob and Sensitivity Selector for a .000A readout on instrument display panel.
11. Record reading on the external DVM to nearest 0.1 millivolt.
12. Refer to Step #8 offset value:

    a. If + value was noted, subtract Step #8 value from Step #11 reading.

    b. If - value was noted, add Step #8 value to Step #11 reading.

    The result is "Corrected Reading #1."

13. Adjust the 100%T/Zero A Knob and Sensitivity Switch to set EXTERNAL DVM reading to 35% (nominal) of "Corrected Reading #1," and record to the nearest 0.1 millivolt.
14. Refer back to the Step #8 offset value:

    a. If + value was noted, subtract Step #8 value from Step #13 reading.

    b. If - value was noted, add Step #8 value to Step #13 reading.

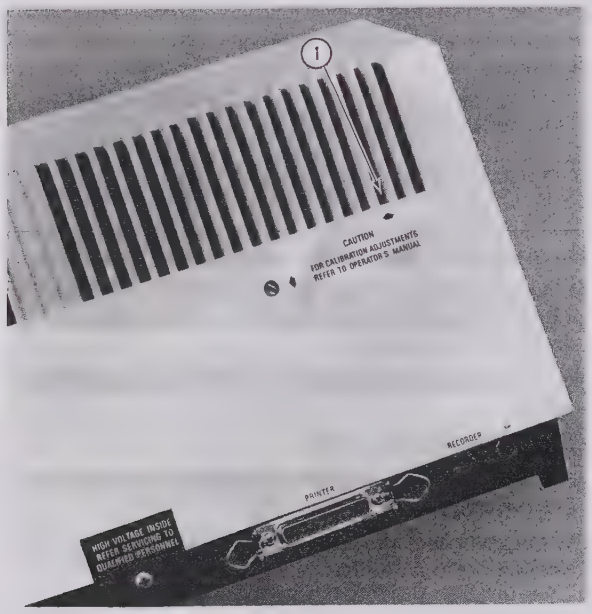
    The result is "Corrected Reading #2."

15. Using a calculator, divide "Corrected Reading #2" (Step #14) by "Corrected Reading #1" (Step #12) and determine to three places. The result is the exact %T offset.
16. Refer to the T-A Conversion table and find the correlating absorbance value.
17. Adjust the "Absorbance Cal" potentiometer on the DVM board until the readout on the instrument DVM reads the absorbance value found in Step #15.

4.8.4 Absorbance to Transmittance Calibration (Digital Models Only, Cat. Nos. 33-22-01 and 33-22-26)

18. Turn on the spectrophotometer and allow it to warm up for 45 minutes.

19. Using the 100%T/Zero A control (and the sensitivity selector if necessary), set 100.0%T on the digital readout and set wavelength to 400nm.
20. Block the light path. Transmittance reading should now be 0.0%. If not, adjust T0 pot for 00.0% (large pot on amp detector board).
21. Remove light block, perform 100% T-0A check, and adjust R29 on DVM board if necessary.
22. Perform 10% T-1A check and adjust R27 on DVM board if necessary. Note: it may be necessary to use wavelength knob to obtain 10%T.
23. Repeat steps 21 and 22 until reading is stable.
24. Set 1% T. Use wavelength knob if necessary.



1. Location of Concentration Factor Potentiometer

Figure 17. Rear View

25. Switch to absorbance and set 2A.

OVERRANGE (□) .000

26. Switch to %T. If reading is not 1.0%, adjust DVM pot to mid-range between 0.9 and 1.1.
27. Repeat steps 25 and 26 until reading is stable.
28. Check relationship 39.9% T and .399A (should be + or - .001A). If not, perform steps 21 through 28 until reading is stable.
29. Set 100%T at 400nm. Block light in sample compartment (readjust T0 pot for 00.0 if necessary).
30. With occluder in sample compartment, switch to absorbance, push factor-set button, and adjust R2 on AMP/DET board for .100. Repeat until reading is stable.

4.8.5 Concentration Factor Calibration (Digital Models Only, Cat. Nos. 33-22-01 or 33-22-41 and 33-22-26 or 33-22-43

31. With mode selector in absorbance, depress Factor-Set button.
32. Keeping button depressed, adjust the concentration factor potentiometer (Figure 17) with the calibration screwdriver to read 0.100 on the digital readout. The location of the concentration potentiometer is shown in Fig. 16.

CAUTION

High voltages are present in the instrument. Do not reach beyond potentiometer.

33. Release the Factor-Set button.

4.8.6 Recorder Voltage Adjust (All Models)

34. Switch the mode selector to transmittance.
35. Using the 100%T/Zero A control, set the instrument for a 100%T readout.
36. Set the "Recorder Voltage Adjust" control on the bottom of the instrument (Figure 13) for 1 VDC at the Recorder jacks on the rear panel.

4.9 T/A CONVERSION Table

TRANSMITTANCE/ABSORBANCE CONVERSION TABLE

Find the transmittance in the T column and the corresponding absorbance in the A column.
Example: a %T of 69.5% = .695 T = 0.158 A

T	A	T	A	T	A	T	A
1.000	0.000						
.995	0.002	.745	0.128	.495	0.305	.245	0.611
.990	0.004	.740	0.131	.490	0.310	.240	0.620
.985	0.007	.735	0.134	.485	0.314	.235	0.629
.980	0.009	.730	0.137	.480	0.319	.230	0.638
.975	0.011	.725	0.140	.475	0.323	.225	0.648
.970	0.013	.720	0.143	.470	0.328	.220	0.658
.965	0.016	.715	0.146	.465	0.333	.215	0.668
.960	0.018	.710	0.149	.460	0.337	.210	0.678
.955	0.020	.705	0.152	.455	0.342	.205	0.688
.950	0.022	.700	0.155	.450	0.347	.200	0.699
.945	0.025	.695	0.158	.445	0.352	.195	0.710
.940	0.027	.690	0.161	.440	0.357	.190	0.721
.935	0.029	.685	0.164	.435	0.362	.185	0.733
.930	0.032	.680	0.168	.430	0.367	.180	0.745
.925	0.034	.675	0.171	.425	0.372	.175	0.757
.920	0.036	.670	0.174	.420	0.377	.170	0.770
.915	0.039	.665	0.177	.415	0.382	.165	0.783
.910	0.041	.660	0.181	.410	0.387	.160	0.796
.905	0.043	.655	0.184	.405	0.393	.155	0.810
.900	0.046	.650	0.187	.400	0.398	.150	0.824
.895	0.048	.645	0.190	.395	0.403	.145	0.839
.890	0.051	.640	0.194	.390	0.409	.140	0.854
.885	0.053	.635	0.197	.385	0.414	.135	0.870
.880	0.056	.630	0.201	.380	0.420	.130	0.886
.875	0.058	.625	0.204	.375	0.426	.125	0.903
.870	0.061	.620	0.208	.370	0.432	.120	0.921
.865	0.063	.615	0.211	.365	0.438	.115	0.939
.860	0.066	.610	0.215	.360	0.444	.110	0.959
.855	0.068	.605	0.218	.355	0.450	.105	0.979
.850	0.071	.600	0.222	.350	0.456	.100	1.000
.845	0.073	.595	0.226	.345	0.462	.095	1.022
.840	0.076	.590	0.229	.340	0.469	.090	1.046
.835	0.078	.585	0.233	.335	0.475	.085	1.071
.830	0.081	.580	0.237	.330	0.482	.080	1.097
.825	0.084	.575	0.240	.325	0.488	.075	1.125
.820	0.086	.570	0.244	.320	0.495	.070	1.155
.815	0.089	.565	0.248	.315	0.502	.065	1.187
.810	0.092	.560	0.252	.310	0.509	.060	1.222
.805	0.094	.555	0.256	.305	0.516	.055	1.260
.800	0.097	.550	0.260	.300	0.523	.050	1.301
.795	0.100	.545	0.264	.295	0.530	.045	1.347
.790	0.102	.540	0.268	.290	0.538	.040	1.398
.785	0.105	.535	0.272	.285	0.545	.035	1.456
.780	0.108	.530	0.276	.280	0.553	.030	1.523
.775	0.111	.525	0.280	.275	0.561	.025	1.602
.770	0.114	.520	0.284	.270	0.569	.020	1.699
.765	0.116	.515	0.288	.265	0.577	.015	1.824
.760	0.119	.510	0.292	.260	0.585	.010	2.000
.755	0.122	.505	0.297	.255	0.594	.005	2.301
.750	0.125	.500	0.301	.250	0.602	.001	3.000

4.10 REMOVAL AND REPLACEMENT PROCEDURES

4.10.1 Main Cover Removal (All Models)

WARNING

Disconnect line cord before proceeding.

1. On the UV models, be sure Lamp House Cover is secured.
2. Remove the hinged sample compartment cover (to the left of the wavelength readout).
3. Remove control knobs:
   a. Wavelength Selector Knob
   b. Mode and Concentration Knobs - pull off
   c. Factor Set Button - unscrew
4. Remove single cover screw at rear of instrument.
5. Pull back and lift up REAR of cover. Grasp lip of front edge and pull forward, "springing" cover edge while lifting to clear front catches on base.
6. Lift off cover, using a rocking motion, using care that cover holes clear the control shafts.

REPLACEMENT

1. Place cover on top of instrument. While pushing down gently, rock cover until it sets down on base.
2. Push down on rear of cover until it slides over rear bosses, and screw hole in base is visible.
3. Install and secure rear cover screw.
4. Push down on front of cover until it locks in place on base latches.
5. Replace all control knobs and check overall instrument performance.

4.10.2 Amp-detector Board, 332201-6164 or 332201-62041

WARNING

Disconnect line cord before proceeding.

1. Refer to the "Main Cover Removal" procedures and remove main cover.
2. Locate the Amp-detector board. Two types of boards have been used:
   a. Older boards are secured with locking wedges. Tilt board gently back and forth while lifting up until the locking wedges are loose.
   b. Newer boards do not use wedges. Gently loosen the board in its mounting slot.
3. Carefully lift the board from the slot without straining the wires. Remove all connectors on the board.

REPLACEMENT

1. Install all board connectors. Ensure that the #1 pin designator on the flex-circuits mate to the #1 male terminal as shown on the component side and land pattern side of the board. (Molex connectors are keyed.)
2. a. New Boards: securely seat into mounting slots.
   b. Old Boards: start board into slot and tilt forward. Reinstall plastic wedges and seat with tip of screwdriver while board is fully positioned.
3. Replace instrument cover and perform operational check.

4.10.2.1 Sensor Boards (332223 and 332224)

Refer to "Detector Maintenance," paragraph 4.5 for procedure.

4.10.3 DVM Board Removal, 332201-6094

WARNING

Disconnect line cord before proceeding.

1. Remove cover - (Refer to procedure).
2. Disconnect flex-circuit molex and ETC connector factor switch to the Amp-detector board.
3. Disconnect the wire running from the concentration factor switch to the Amp-detector board.
4. Separate in-line molex connector.
5. Unplug display board (-6084).
6. Carefully remove BCD flex circuit.
7. Remove the screw securing the DVM ground connector to the ground plate.
8. Remove the three screws securing the DVM brackets to the instrument base.

REPLACEMENT

1. Install DVM board replacement by reversing the above steps.

4.10.3.1 Display Board Removal (-6084)

1. Remove cover (refer to procedure).
2. Unplug display board.

4.10.4 UV-power Supply Board, 332225-6024

WARNING

Disconnect line cord before proceeding.

1. Remove main cover.
2. Loosen cover hold-down screw on lamp house and tilt back lamp house cover.
3. Disconnect 6-pin connector coming from lamp house UV power supply board.
4. Remove all other connections to board and disconnect wire going to fan motor support plate.
5. Remove clamp securing the capacitor to the instrument base and lift out board.

REPLACEMENT

To replace, reverse the above procedure.

4.10.5 Chopper (Fan) Motor, 332201-681

WARNING

Disconnect line cord before proceeding.

1. Remove right-hand DVM bracket from DVM board and instrument base and reposition bracket away from fan motor area.
2. Remove the two screws holding the heat-sink assembly to the fan motor support.
3. Remove both front and rear fan support screws and lift fan support clear.
4. Disconnect fan molex connector.
5. Remove fan motor. Remove alignment pin from fan motor laminations.

REPLACEMENT

1. Replace the alignment pin in the fan motor lamination and position fan motor in base so that the alignment pin rests in the slot provided for it in the base.
2. Replace the fan support plate making sure that the fishpaper is between the plate and laminations. Secure the support plate.
3. Replace the transistor heat-sink assembly and secure.
4. Replace the DVM bracket and secure DVM board.
5. Reconnect the fan motor molex connector.
6. Replace cover.

4.10.6 Sync Detector, 332201-223

WARNING

Disconnect line cord before proceeding.

1. Remove cover.
2. Remove fan motor and motor support plate. Refer to procedure.
3. Remove screw securing Sync Detector Assembly.
4. Carefully separate molex wafer connector on Sync Detector Assembly from connector on flex circuit. This is a delicate procedure and caution must be used to prevent damaging the flex circuit.

REPLACEMENT

1. To replace Sync Detector Assembly, reverse the above procedure.

4.10.7 Main Flex Circuit, 332201-614

WARNING

Disconnect line cord before proceeding.

1. Remove cover.
2. Remove Sensor board assembly.
3. Unhook plastic sample compartment cover.
4. Unhook springs holding base front plate and remove. Disconnect ground wire.
5. Carefully bend back front plate holding tabs and remove plate.
6. For Cat. Nos. 33-22-01 and 33-22-26, remove %T Adjustment Wheel and Gain Select Wheel. For Cat. No. 33-22-25, remove the -291 Knob Assembly and the -292 Assembly.
7. Remove mounting nuts on the adjustment pot and gain switch.
8. Remove screw and standoff securing flex-circuit to Sensor cover.
9. Unsnap wafer connector from Sensor cover. Disconnect flex-circuit from the Amp-detector board.
10. Lift our flex-circuit and replace.

REPLACEMENT

The replacement procedure is essentially the reverse of the steps listed above with the exception that the pot and the switch are secured to the base first.

4.10.8 Transformer Assembly

WARNING

Disconnect line cord before proceeding.

1. Remove cover assembly.
2. Remove Amp-detector board.
3. Remove green/yellow ground wires from ground plate.
4. Remove DVM board assembly (on models 33-22-01 and 33-22-26).
5. Disconnect fan-motor molex from transformer.
6. Remove molex connections to UV power supply board (on models 33-22-25 and 33-22-26).
7. Remove the two screws securing line change switch to base. Remove switch assembly.
8. Remove screws securing transformer to base. Partially lift transformer out of base. Remove fishpaper barrier underneath transformer, and disconnect remaining leads.
9. Lift transformer assembly out of instrument

REPLACEMENT

To replace the transformer assembly, reverse the above procedure. Orient switch to position grey leads on the left-hand side as viewed from the front.

4.10.9 Flex Circuit, 332201-607

WARNING

Disconnect line cord before proceeding.

1. The following assemblies must be removed in order to change the -607 flex circuit. Refer to the appropriate section for removal instructions for the assemblies listed.
   a. Amp-detector board
   b. DVM board
   c. Transformer assembly
   d. Fan motor assembly
   e. Sync-detector assembly
2. Pry off clip holding lamp wires to wall of instrument base.
3. Remove contacts on end of red and green wires from lamp board socket.
4. Remove entire flex circuit assembly from instrument.

REPLACEMENT

1. To replace the flex circuit assembly, reverse the above procedure.

NOTE

The red and green wires, and the small board that is attached, must be fed through the small square hole that contains the line switch wires. Care must be taken at this step to guard against flex circuit breakage.

2. Before reinstalling the sync-detector assembly, position the power switch cable over the top of the flex circuit. The cable and flex circuit is held flat against the base by the sync-detector assembly.

4.10.10 Lamp House, 332225-250

WARNING

Disconnect line cord before proceeding.

1. Remove instrument cover.
2. Loosen hold-down screw on lamp house and tilt cover back.
3. Disconnect tungsten lamp supply molex connector and remove wire from junction bracket.
4. Remove screw holding relay lens to base and remove lens/junction bracket assembly.
5. Disconnect UV Power Supply.
6. Remove four screws securing lamp house to rails.
7. Lift lamp house off rails.

REPLACEMENT

1. To replace lamp house, reverse the above procedure.
2. Perform the lamp alignment procedure for both the tungsten and deuterium lamp.

4.10.11 Monochromator Disassembly

WARNING

Disconnect line cord before proceeding.

4.10.11.1 Grating

1. Remove main cover.
2. Remove the Sensor cover, and then the monochromator dust cover by sliding it to the left and lifting off.
3. Plug in the instrument and turn on the tungsten lamp. Install the monochromator alignment tool, Cat. No. SP21-H-147229, over the wavelength cam follower bearing. Rotate the wavelength dial until white light (zero order) is central on the exit slit of the monochromator and record the number on the wavelength dial. This number will serve as a reference for aligning the replacement grating assembly.
4. Remove retaining nut and the Wavelength Index Plate Assembly.

CAUTION

Do not touch any mirror surfaces.

5. Lift straight up on the wavelength cam and remove, being careful not to allow cam follower arm on filter assembly arm to snap against the cam post.
6. Disconnect both ends of the cam follower arm spring and rotate spring clear of the grating.
7. Remove the grating strap. Remove top ball bearing from grating assembly and lift assembly out of base.

REPLACEMENT

1. Prior to reassembly, apply "Teflon" powder to top and bottom ball bearings and bearing cones, wavelength cam shaft, filter bearing pivot, and all metal-to-plastic friction points.
2. To replace the grating assembly, reverse the above procedure.
   a. Ensure that the entrance slit is fully seated.
   b. Adjust the grating strap to position the tungsten lamp zero-order image as noted in disassembly Step #3 at the reference wavelength. Remove the monochromator alignment tool.
3. Perform a Wavelength Calibration procedure.

4.10.11.2 Filter Assembly

1. Remove grating assembly using above procedures.
2. Disconnect filter assembly spring from slot in base, and lift out filter assembly.

REPLACEMENT

1. Prior to reassembly, apply "Teflon" powder to all metal-to-plastic friction points, e.g., filter pivot, wavelength shaft, top and bottom grating bearings, etc.
2. Reverse procedures for reassembly. Perform a Wavelength Calibration procedure.

4.10.11.3 Mirror Replacement and Alignment Procedures (UV Models)

CAUTION

The UV instruments have three mirrors in the monochromator. If more than one mirror is replaced, the first must be aligned and secured before proceeding, and must not be disturbed as other mirrors are replaced.

1. Remove instrument cover and monochromator cover.
2. Set wavelength to 230nm, nominal, and turn on tungsten lamp.
3. Insert grating cam follower bearing into the monochromator alignment tool and tighten the set screw.
4. Carefully adjust the wavelength dial until the grating zero order (white light) is exactly centered on the exit slit. Note the wavelength value. Do NOT move the grating assembly after this adjustment as it is used as a reference.
5. Remove the old mirror: concave mirror - grasp across diameter and twist to break loose; plano mirror - remove holding screw.

NOTE

If the bottom pin on the plano mirror is broken, the remnant must be drilled out of the base. Drill to the depth of the bottom pin on the replacement mirror.

6. Install the new mirror and adjust so the zero-order image central on the exit slit agrees with the wavelength number noted on the dial in Step #4.

CAUTION

Do not touch mirror surfaces.

7. When adjusted, secure mirror: concave mirror - apply watch crystal cement and allow to dry. Plano mirror - tighten set screw. MIRROR MUST BE SECURED BEFORE proceeding.
8. Return to Step #5 if additional mirrors are to be replaced.
9. When the mirror replacements have been completed, ensure that the "white light" image central on the exit slit is still in agreement with the wavelength dial number noted in Step #4.
10. Replace monochromator cover, check the wavelength calibration, and adjust if necessary. Install instrument cover and check overall performance.

4.10.11.4 Mirror Replacement and Alignment Procedure (Visible Model)

1. Remove instrument cover and monochromator cover.
2. Set wavelength to 230nm, nominal.
3. Plug in the instrument and turn on the tungsten lamp. Install the monochromator alignment tool, Cat. No. SP21-H-147229, over the wavelength cam follower bearing. Rotate the wavelength dial until white light (zero order) is central on the exit slit of the monochromator and record the number on the wavelength dial. This number will serve as a reference for aligning the replacement grating assembly.
4. Remove the mirror by grasping with pliers across the diameter and twisting to break loose.
5. Install the new mirror and adjust so the zero-order image central on the exit slit agrees with the wavelength number noted on the dial in Step #4.

CAUTION

Do not touch mirror surfaces.

6. Apply watch crystal cement to mirror mount and allow to dry. This is important since monochromator cover can hit the mirror tab.
7. Replace monochromator cover, check the wavelength calibration, and adjust if necessary. Install instrument cover and check overall performance.

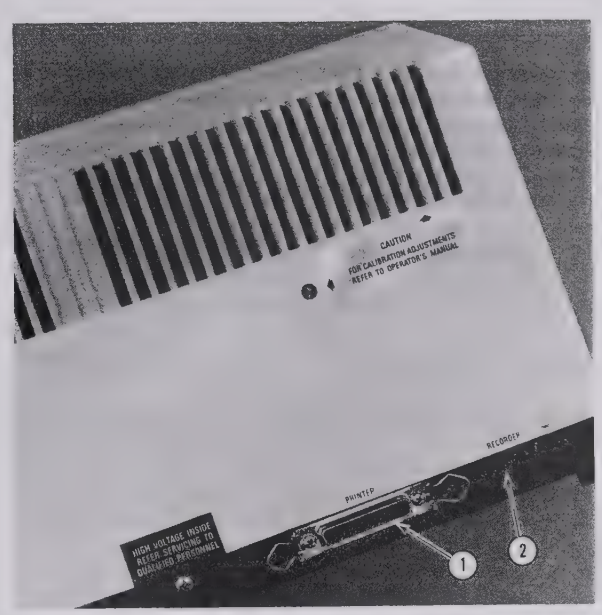
SECTION 5.
ACCESSORIES

5.1 READOUT DEVICES

5.1.1 DP-110 Data Processor, Cat. No. 34-31-70

The DP-110 Data Processor (Figure 18) was produced for use with the DV (Cat. No. 33-22-01) and UVD (Cat. No. 33-22-26) models of the SPECTRONIC 21 spectrophotometer. With a minimum of operator attention, the DP-110 provides a paper-tape printout of the sample values in either endpoint or time-rate operation. Sequential sample identification values are also printed on the tape. Endpoint results can be printed in both concentration and absorbance values. The DP-110 calculates and prints kinetic rates in absorbance change (A) or International Enzynme Units (U). The BCD output connector for the DP-110 is located on the lower rear panel of the instrument. Complete operating instructions are given in the Operator's Manual supplied with the DP-110. The DP-110 required the Cat. No. 33-22-49 Interface.

Figure 18. DP-110 Data Processor



1. BCD Output Connector for DP-110
2. Analog Output Jacks for 10" Strip Chart Recorder

Figure 19. Rear Panel

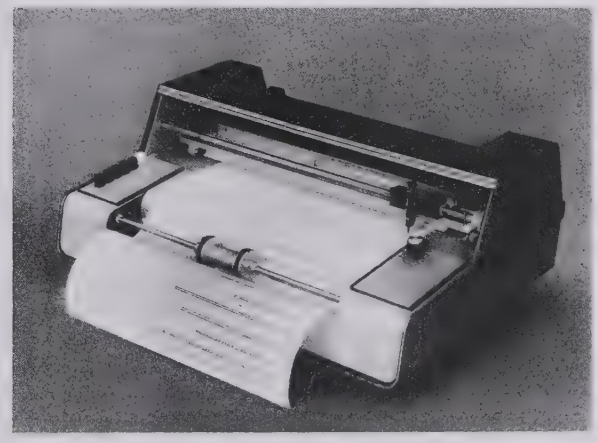


Figure 20. 10" Strip-Chart Recorder

5.1.2 Bausch & Lomb 10″ Strip-Chart Recorder, Cat. No. 39-11-20

The Bausch & Lomb 10″ Strip-Chart Recorder is recommended whenever a permanent record of photometric values obtained during sample analysis is desired. The 10″ Strip-Chart Recorder is also useful for monitoring a changing value, as in time-rate enzyme procedures. Unless the Digital-to-Analog Converter (Cat. No. 33-22-46) is installed, the recorder results will be in transmittance only. The analog output jack for the 10″ Strip-Chart Recorder is located on the rear lower panel of the instrument. Complete operating instructions are given in the Operator's Manual supplied with the recorder. The Bausch & Lomb 10″ Strip-Chart Recorder requires the Cat. No. 39-20-11 patch cord to connect the recorder to the instrument.

NOTE

Log-linear recorders will permit direct recording in T, A, or C.

5.1.3 Digital-to-Analog Converter, Cat. No. 33-22-46

The Digital-to-Analog Converter (Figure 20), for use with the DV (Cat. No. 33-22-01) and UVD (Cat. No. 33-22-26) models of the SPECTRONIC 21 spectrophotometer, provides linear outputs in absorbance and concentration modes at the recorder output terminals. Installation of the digital-to-analog converter is a service procedure and should be done by qualified service personnel.

5.2 SAMPLE HANDLING ACCESSORIES

5.2.1 General Purpose Sample Compartment, Cat. No. 33-22-30

The General Purpose Sample Compartment, for use outside the main instrument, is supplied with lens system and multiple sample holder. This accessory can be used with any model of the instrument. For use with models DV (Cat. No. 33-22-01/33-22-41) and MV (Cat. No. 33-22-02/33-22-42), the General Purpose Sample Compartment requires the Cat. No. 33-22-31 Optical Rail Assembly. For use with the UVM (Cat. No. 33-22-25) and UVD (Cat. No. 33-22-26) models, the General Purpose Sample Compartment requires the Cat. No. 33-22-29 Optical Rail Assembly. Complete installation instructions are supplied with the General Purpose Sample Compartment.

Figure 21. Model DV Spectronic 21 spectrophotometer with the General Purpose Sample Compartment

5.2.2 For Use With the General Purpose Sample Compartment

OPTICAL RAIL ASSEMBLY, CAT. NO. 33-22-31

This Optical Rail Assembly is required for use with the General Purpose Sample Compartment (Cat. No. 33-22-30) with the DV model SPECTRONIC 21 spectrophotometer (Cat. No. 33-22-01/33-22-41) and with the MV model (Cat. No. 33-22-02/33-22-42).

OPTICAL RAIL ASSEMBLY, CAT. NO. 33-22-29

This Optical Rail Assembly is required for use with the General Purpose Sample Compartment with models UVM (Cat. No. 33-22-25) and UVD (Cat. No. 33-22-26) of the SPECTRONIC 21 spectrophotometer.

THERMO-REGULATED CUVETTE HOLDER, CAT. NO. 33-20-14

The Thermo-Regulaged Cuvette Holder is a water-jacketed multiple sample holder. This three-position thermo block maintains 1cm square cuvettes at temperatures between 5° and 55° while measurements are being made on samples requiring a temperature-controlled environment.

5.2.3 For Use With Main Instrument Sample Compartment

CUVETTE ADAPTER, CAT. NO. 33-22-08

Required for short cuvettes, 45 to 48mm tall.

SAMPLE COMPARTMENT COVER. CAT. NO. 33-22-07

For test tubes or cuvettes up to 102mm tall.

SPACER, CAT. NO. 33-17-96

For use with short path, 88mm tall, cuvettes.

SPACER, CAT. NO. 33-17-99

For use with 1mm pathlength cuvettes, 45mm tall.

SPACER, CAT. NO. 33-17-98

For use with 2mm pathlength cuvettes, 45mm tall.

SPACER, CAT. NO. 33-17-97

For use with 5mm pathlength cuvettes, 45mm tall.

SECTION 6.
DIAGRAMS & PARTS LISTS

6.1 INTRODUCTION

This section contains diagrams and associated parts lists for all models of the SPECTRONIC 21 spectrophotometers. Included are schematics, printed circuit board assemblies, flex-circuits and major mechanical assemblies. The diagrams include the following symbols:

▽ Common Ground

▽3 Circuit Ground - all such symbols with the same number on the name drawing are connected to a common ground tie point.

(39) Callout for part item 39, quantity of 1.

(39/2) Callout for part item 39, quantity of 2.

-669 Partial part number. For example, if this number appears as a callout on a drawing for Model 33-22-01, the full part number is 332201-669.

⊘ Screwdriver Adjustment

6.2 EXPLANATION OF MODEL STRUCTURE TABLE

The design of the SPECTRONIC 21 spectrophotometer provides several circuit boards, schematics, and mechanical assemblies which are common to two or more of the instrument variations. The following structure table lists all drawings for all models and their specific application(s). Parts lists, if not given on a particular assembly drawing, immediately follow the drawing.

For example, Sensor Board Assembly 332224-603 is used in the -01/-41 and -02/-42 models. Flex-Circuit Assembly 332201-6144 is used in both the -01 and the -26, while the Amp-Detector Board 332201-6164 is used in all models.

To determine which drawings or assemblies are associated with a given instrument model, simply run down the "used with" column to the appropriate check marks.

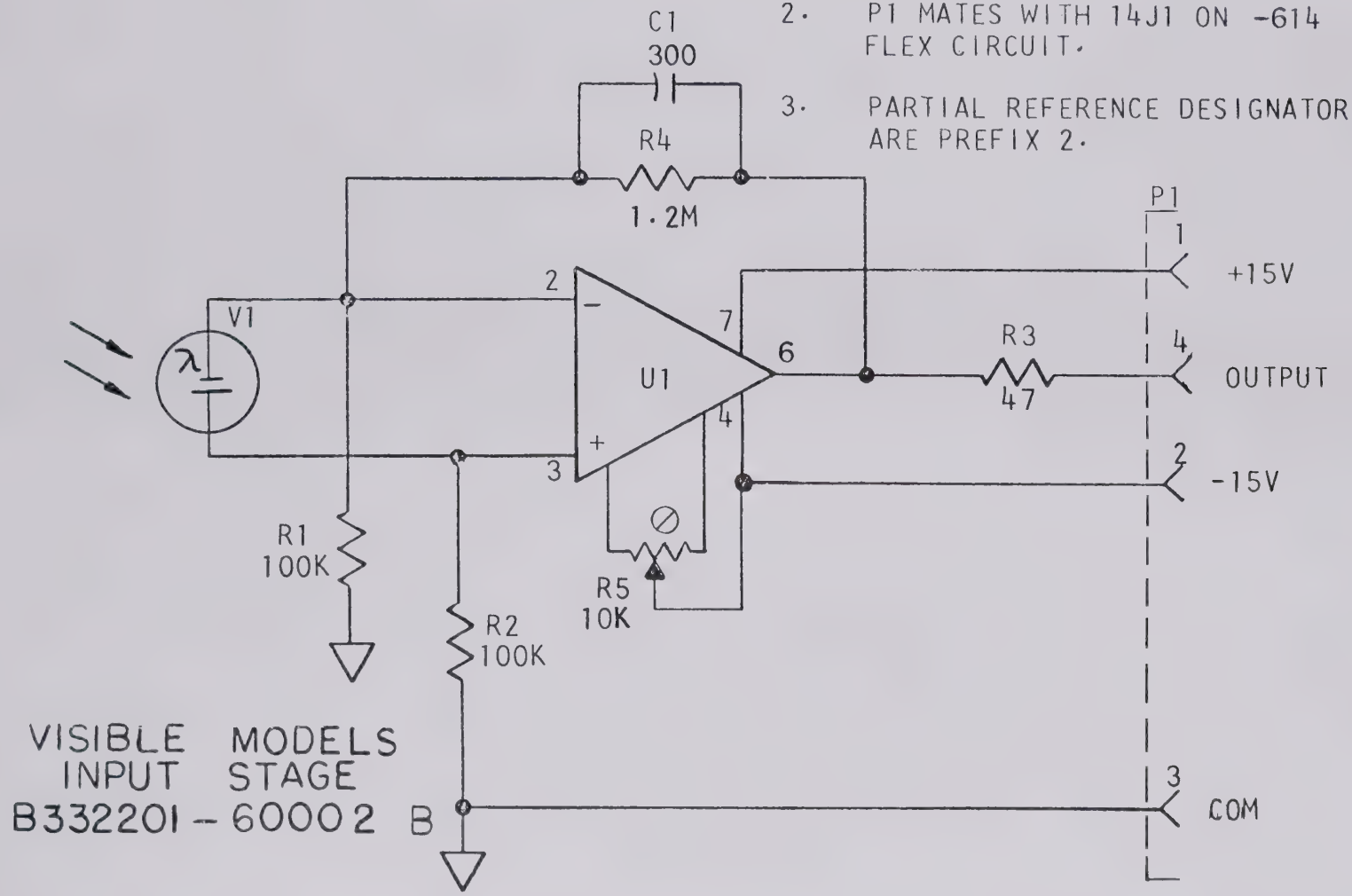
6.3 MODEL STRUCTURE AND ASSEMBLY INTERCHANGEABILITY TABLE

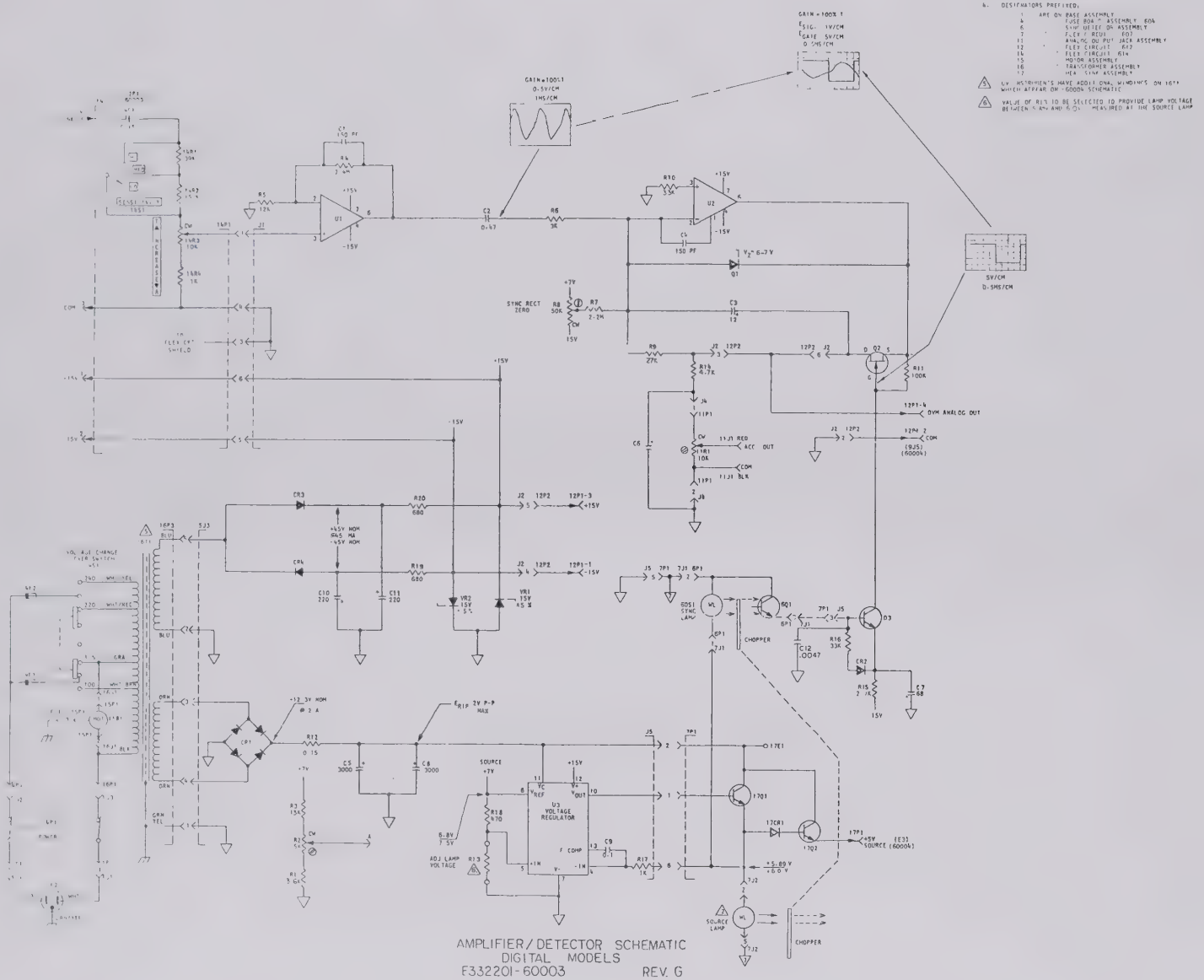
Description	Drawing No.	Used With: -01/-41	-02/-42	-25	-26/-43	Page No.
Input Stage Schematic - VISIBLE MODELS	332201-60002	X	X			6-3
Amp/Detector Schematic - DIGITAL MODELS	332201-60003	X			X	6-4
DVM Schematic	332201-60004	X			X	6-5
Display Schematic (without DPS)	332201-60005	X			X	6-6
Acc. Output Interconnection Schematic	332201-60006	X			X	6-7
Display "3" Schematic	332201-60007	X			X	6-8
Amp/Detector Schematic	332201-60008	X			X	6-9
Input Stage Schematic - UV MODELS	332225-60002		X	X	X	6-10
Amp/Detector Schematic - METER MODEL	332225-60003			X		6-11
UV Power Supply Schematic	332225-60004			X	X	6-12
Digital-to-Analog (D/A) Converter Schematic	332246-60001	X			X	6-13
Sensor Board Assembly - VISIBLE MODEL	332224-603601	X	X			6-14
Amp/Detector Board Assembly - ALL MODELS	332201-616401	X	X	X	X	6-16
DVM Board Assembly	332201-6094	X			X	6-20
Display Board Assembly	332201-6084	X			X	6-26
Digital-to-Analog (D/A) Converter Board Assembly	332246-6024	X			X	6-28
Sensor Board Assembly - UV MODELS	332223-603601			X	X	6-30
UV Power Supply Board Assembly	332225-6024			X	X	6-32
Main Assembly	332201-200	X				6-34
Cover Assembly	332201-170	X				6-35
Base Assembly	332201-15001	X				6-36
Synch Detector Assembly	332201-223 (-113*)	X	X	X	X	6-42
Output Jack Assembly	332201-676	X	X	X	X	6-43
Transformer Assembly	332201-679	X				6-44
Motor Assembly	332201-681	X	X	X		6-45
Heatsink Assembly	332201-724	X			X	6-46
Switch Assembly	332201-731	X	X	X	X	6-47
Fuse Board Assembly	332201-6044	X	X	X	X	6-48
Flex Circuit Assembly	332201-6144	X			X	6-49
Main Assembly	332225-200			X		6-50
Cover Assembly	332225-170			X		6-51
Base Assembly	332225-150			X		6-52
Lamp House Assembly	332225-250			X	X	6-56
Lamp House Cover Assembly	332225-249			X	X	6-59
Transformer Assembly	332225-642			X		6-60
Heatsink Assembly	332225-644			X		6-61
Cable Assembly	332225-1606			X	X	6-62
Flex Circuit Assembly	332225-6054			X		6-63
Main Assembly	332226-200				X	6-64
Cover Assembly	332226-170				X	6-65
Base Assembly	332226-15001				X	6-66
Transformer Assembly	332226-641				X	6-70
Sample Compartment Components	332201-195	X	X	X	X	6-71

**For use with 332201-620401 Amp/Detector Board only*

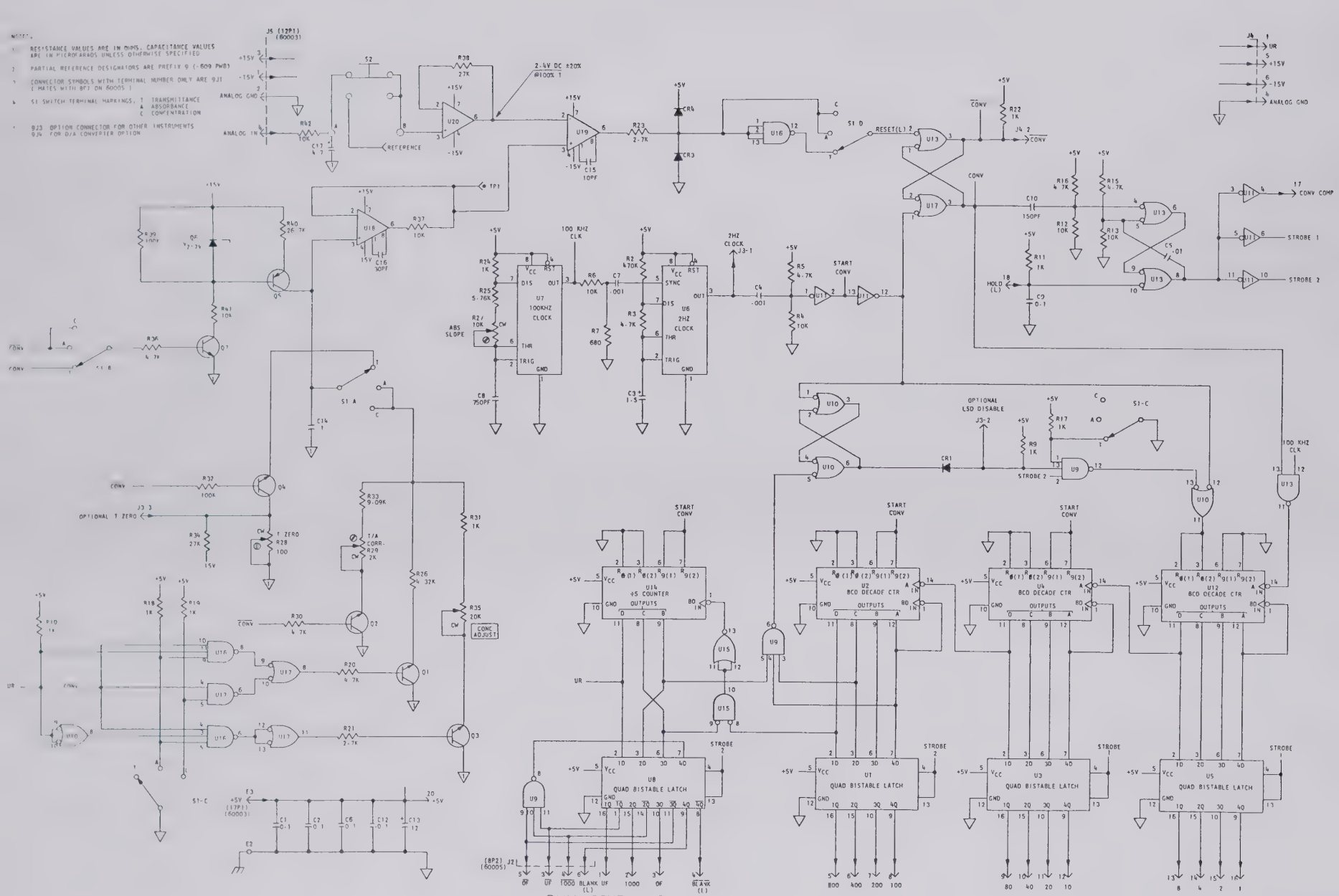
NOTES:

1. RESISTOR VALUES IN OHMS, CAPACITOR VALUES IN PICOFARADS.
2. P1 MATES WITH 14J1 ON -614 FLEX CIRCUIT.
3. PARTIAL REFERENCE DESIGNATORS ARE PREFIX 2.

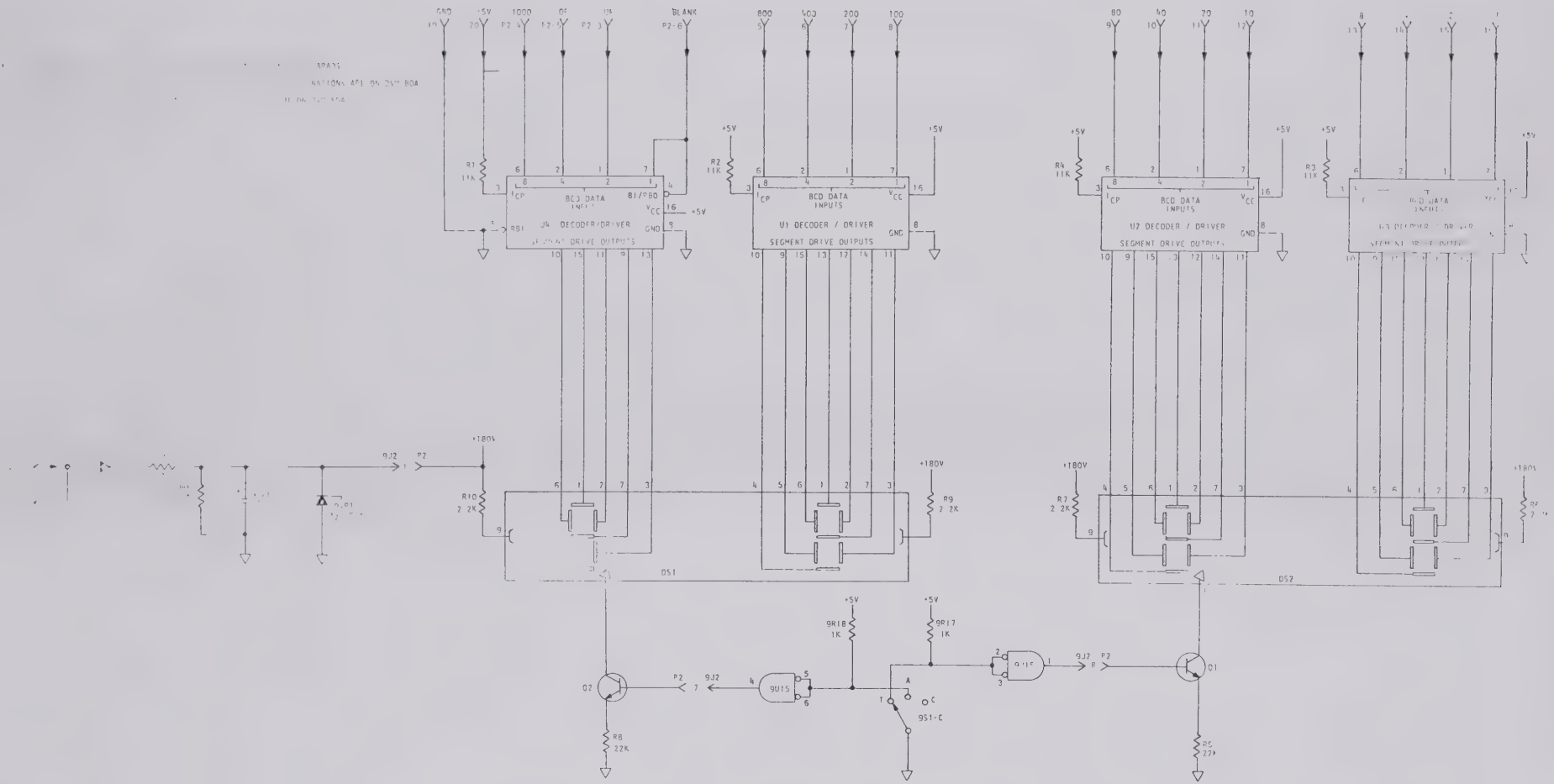




AMPLIFIER/DETECTOR SCHEMATIC
DIGITAL MODELS
F332201-60003 REV. G



DVM SCHEMATIC 33220I-60004 REV. E

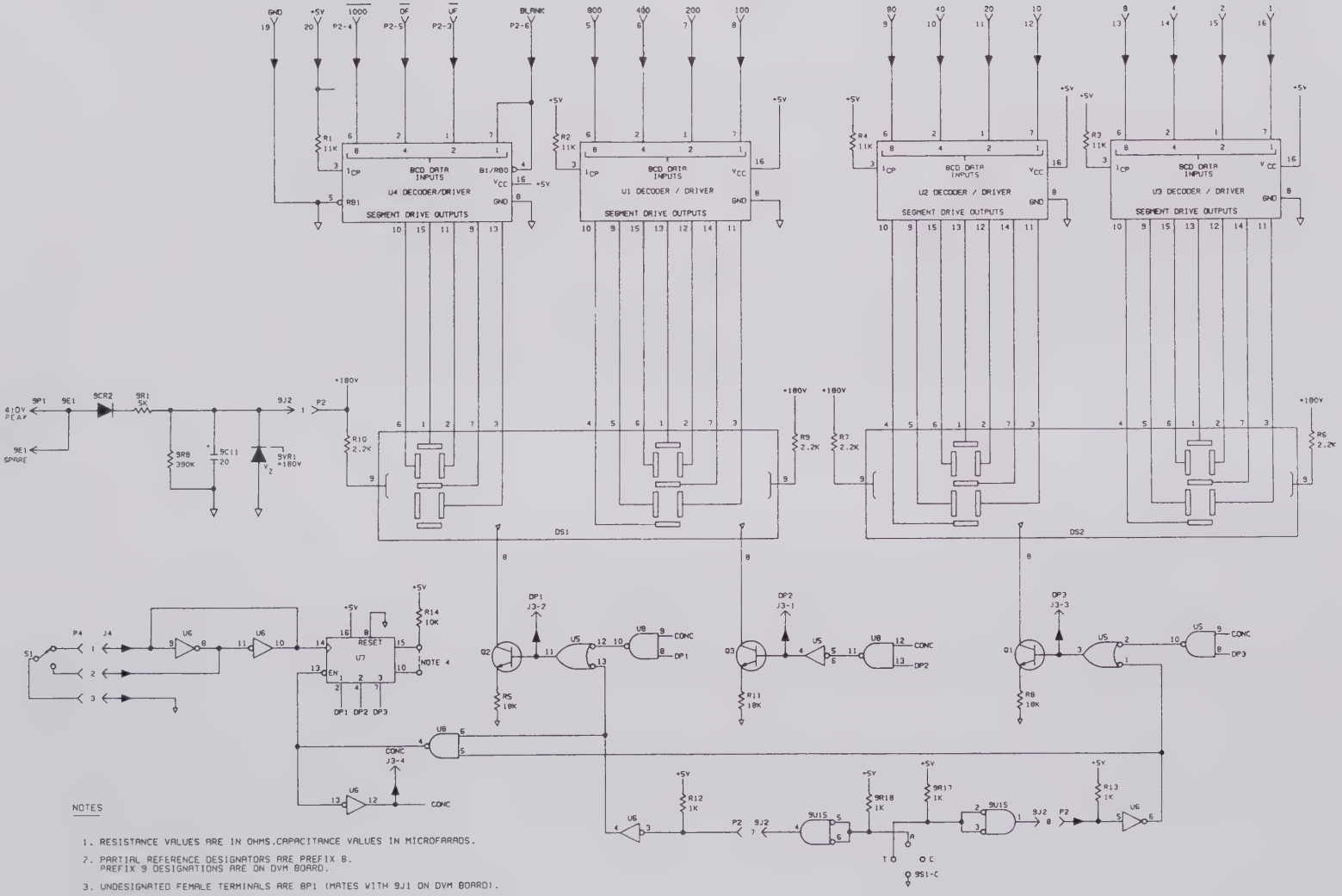


DISPLAY SCHEMATIC
332201-60005

FUNCTION	FROM DVM 9J1	TO DISPLAY 8P1	DECIMAL POINT 8P3	FLEX CIRCUIT 13P1	ACCESSORY OUTPUT 13J3
+5V	20	20		20	9
5V COM	19	19		19	4 & 5
$\overline{\text{BLANK}}$ (L)	4			4	25
CONC			4		6
CONV. COMP.	17			17	2
DP1			2		8
DP2			1		10
DP3			3		7
HOLD	18			18	3
OVER	3			3	13
UNDER	1			1	11
1	16	16		16	1
2	15	15		15	14
4	14	14		14	15
8	13	13		13	16
10	12	12		12	17
20	11	11		11	18
40	10	10		10	19
80	9	9		9	20
100	8	8		8	21
200	7	7		7	22
400	6	6		6	23
800	5	5		5	24
1000	2			2	12

ACCESSORY OUTPUT INTERCONNECTION SCHEMATIC

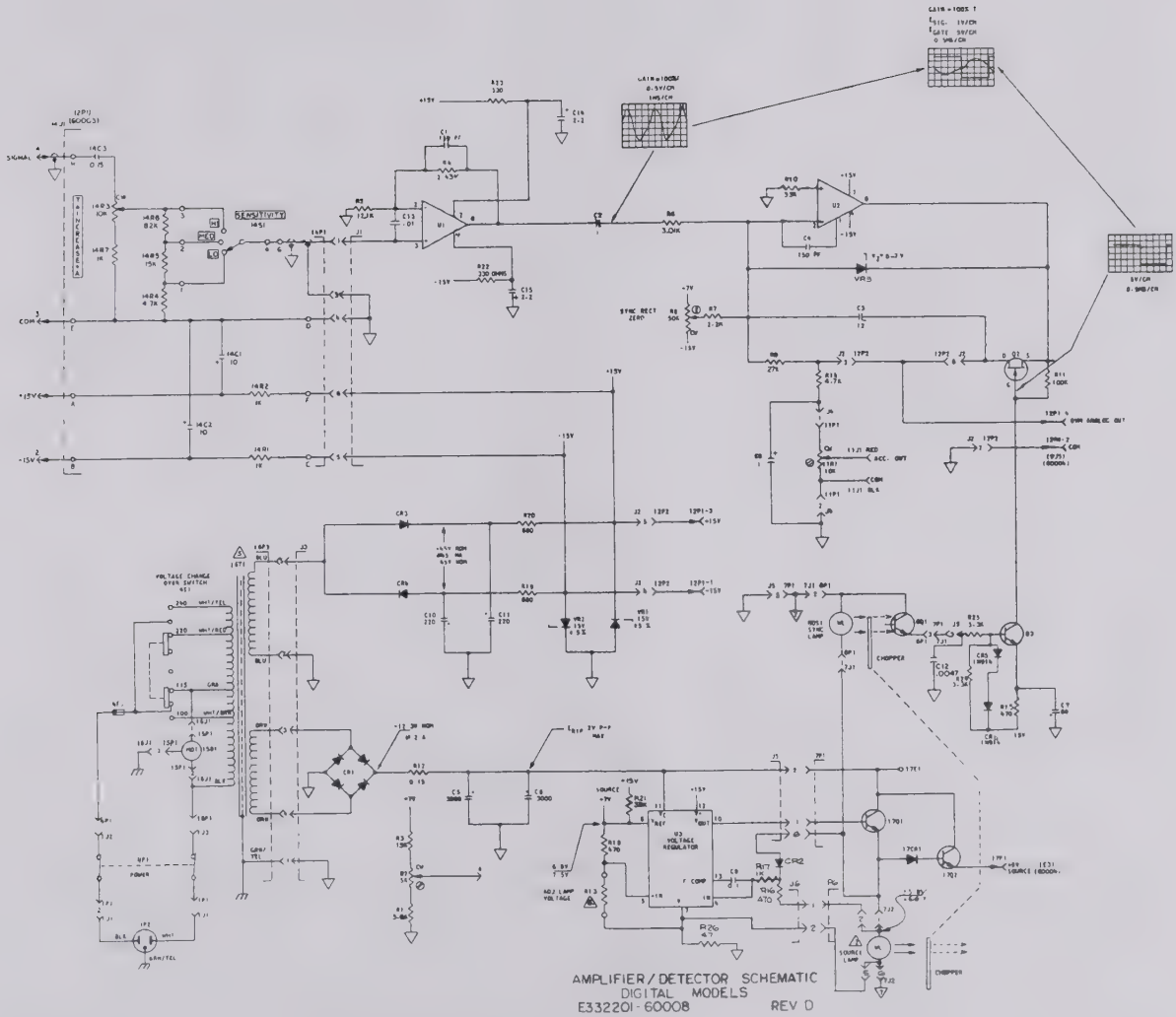
332201-60006



NOTES

1. RESISTANCE VALUES ARE IN OHMS. CAPACITANCE VALUES IN MICROFARADS.
2. PARTIAL REFERENCE DESIGNATORS ARE PREFIX 8.
   PREFIX 9 DESIGNATIONS ARE ON DVM BOARD.
3. UNDESIGNATED FEMALE TERMINALS ARE 8P1 (MATES WITH 9J1 ON DVM BOARD).
4. TO REMOVE CONCENTRATION DECIMAL POINT OPTION, REMOVE JUMPER WIRE

DISPLAY 3 SCHEMATIC
332201-60007
REV-C -

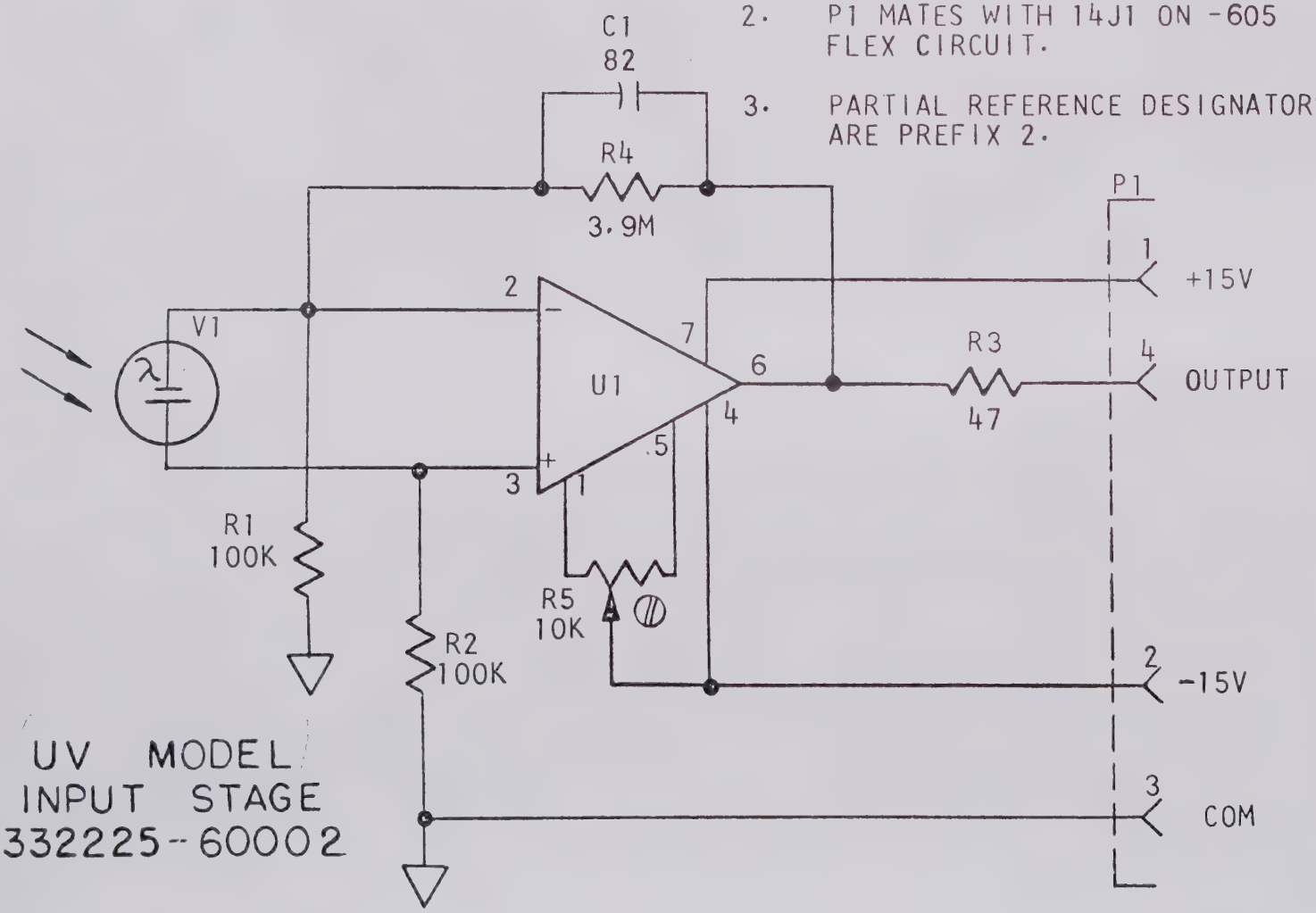


AMPLIFIER/DETECTOR SCHEMATIC
DIGITAL MODELS
E332201-60008 REV D

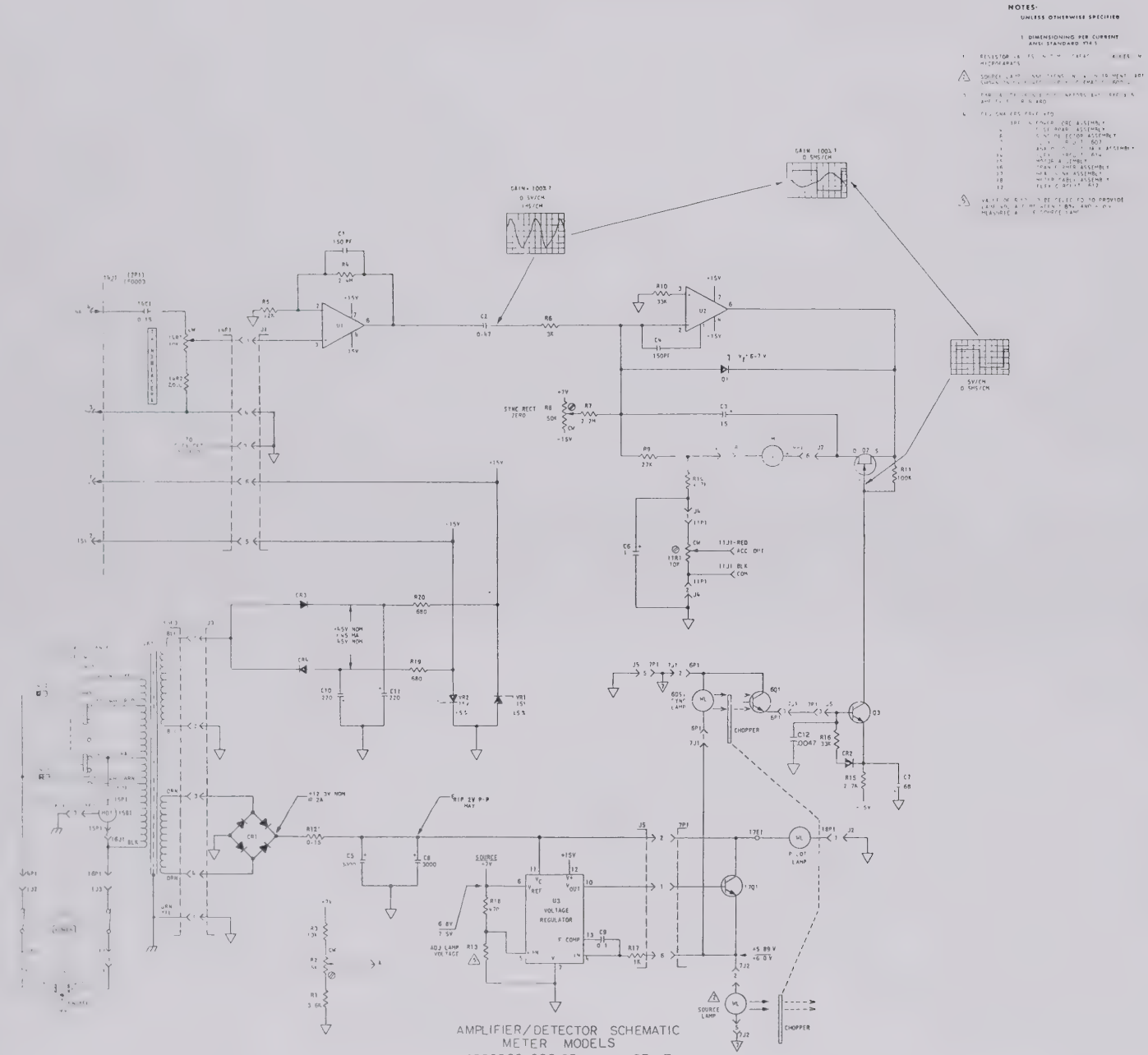
NOTES:

UNLESS OTHERWISE SPECIFIED

1. RESISTOR VALUES IN OHMS, CAPACITOR VALUES IN PICOFARADS.
2. P1 MATES WITH 14J1 ON -605 FLEX CIRCUIT.
3. PARTIAL REFERENCE DESIGNATORS ARE PREFIX 2.

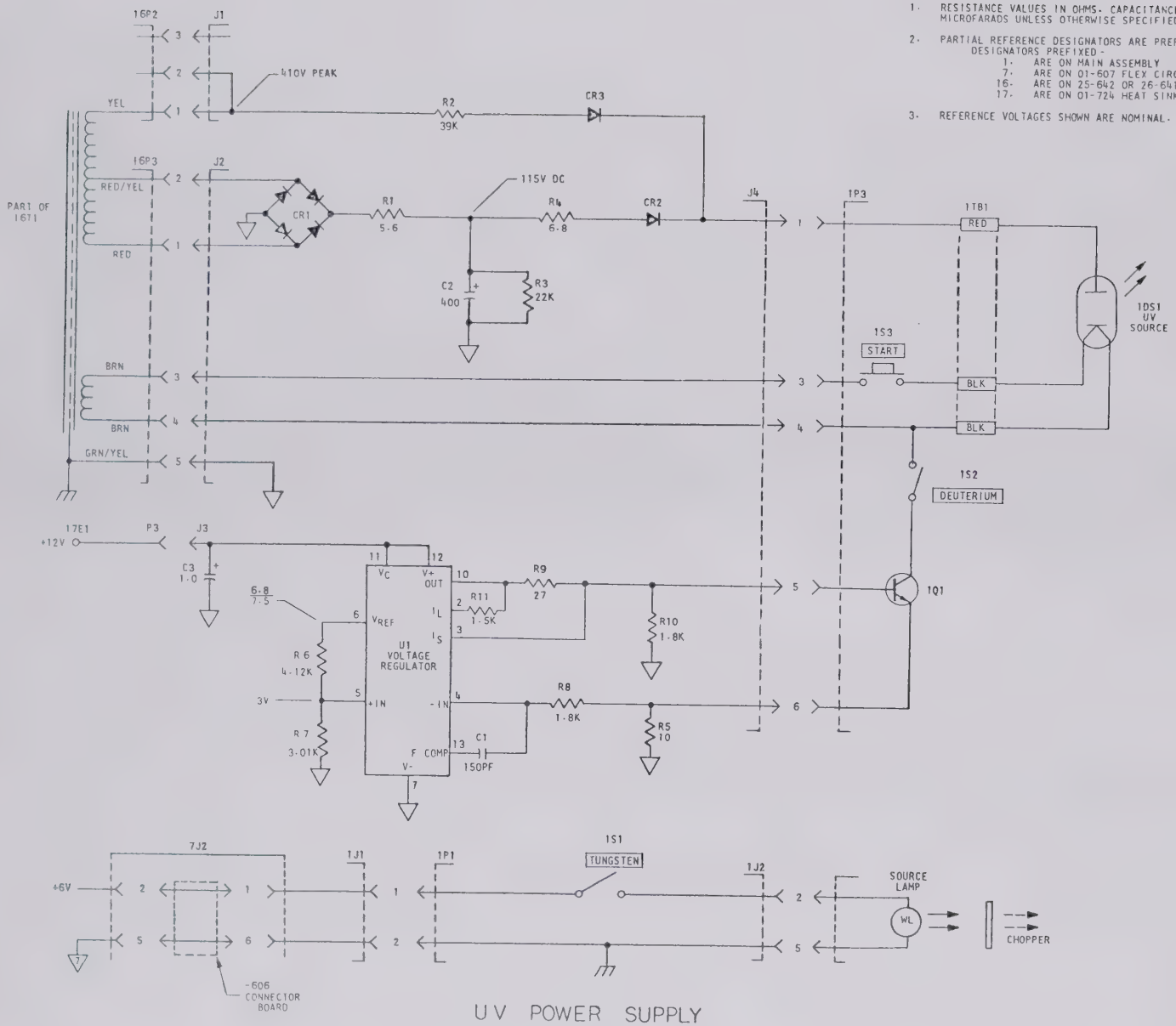


UV MODEL
INPUT STAGE
B332225-60002

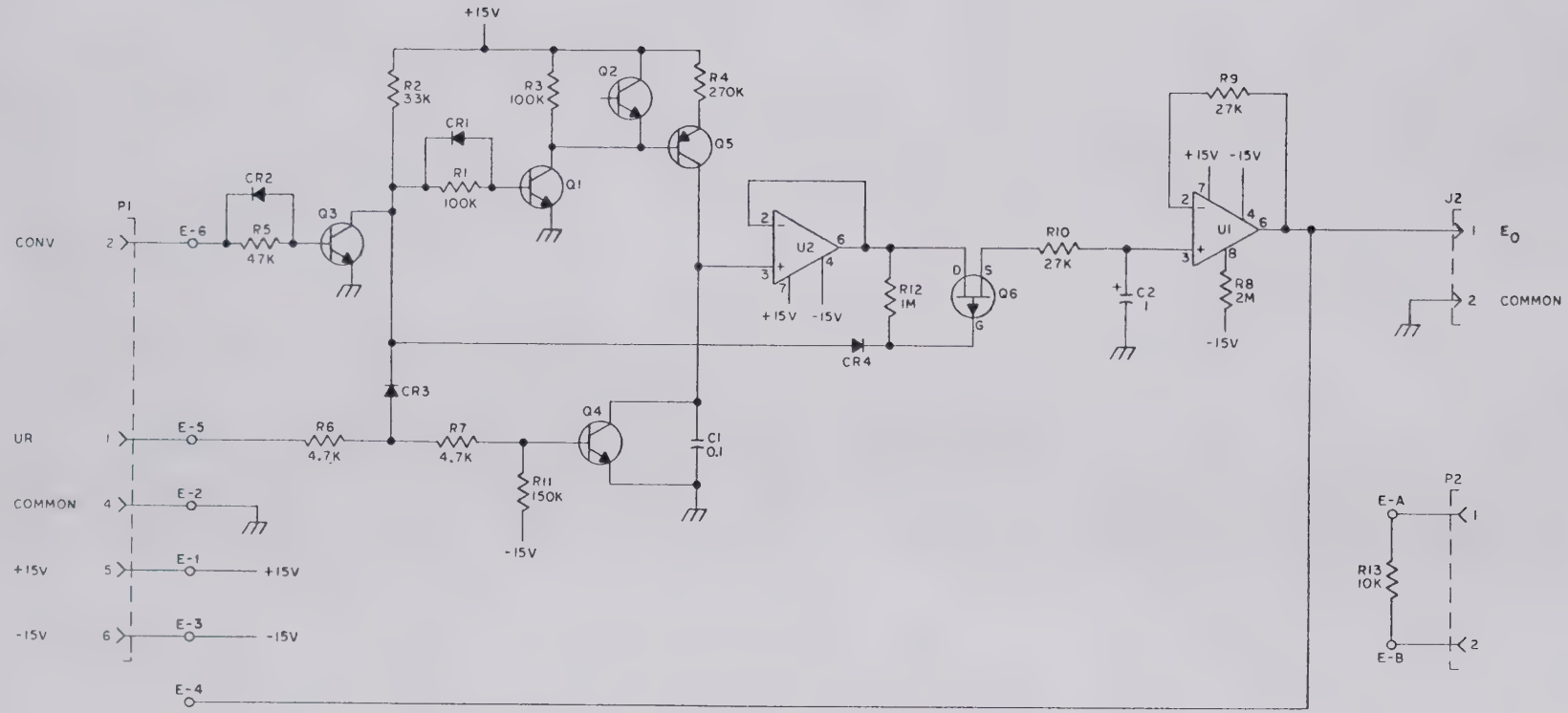

NOTES:
UNLESS OTHERWISE SPECIFIED
1. DIMENSIONING PER CURRENT ANSI STANDARD Y14.5
GAIN 100X ↑ 0.5MS/CM
GAIN 1000X ↑ 0.5MS/CM
5MS/CM 0.5MS/CM
SYNC RECT ZERO
+15V
-15V
+7V
+12.3V NOM @ 2A
RIP 3V P-P MAX
+45V NOM +45 MA -45V NOM
SOURCE
+5V
U3 VOLTAGE REGULATOR
F COMP
ADJ LAMP VOLTAGE
6.8V 7.5V
+5.89V +6.0V
SOURCE LAMP
CHOPPER
P.07 LAMP
605 .114" LAMP
ACC OUT
COM
AMPLIFIER/DETECTOR SCHEMATIC
METER MODELS
E332225-600-03 REV. E

NOTES

1. RESISTANCE VALUES IN OHMS. CAPACITANCE VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
2. PARTIAL REFERENCE DESIGNATORS ARE PREFIX 2 ON -602 PWB DESIGNATORS PREFIXED -
   1- ARE ON MAIN ASSEMBLY
   7- ARE ON 01-607 FLEX CIRCUIT
   16- ARE ON 25-642 OR 26-641 TRANSFORMER ASS'Y
   17- ARE ON 01-724 HEAT SINK ASSEMBLY
3. REFERENCE VOLTAGES SHOWN ARE NOMINAL.



UV POWER SUPPLY
332225-60004 REV. B



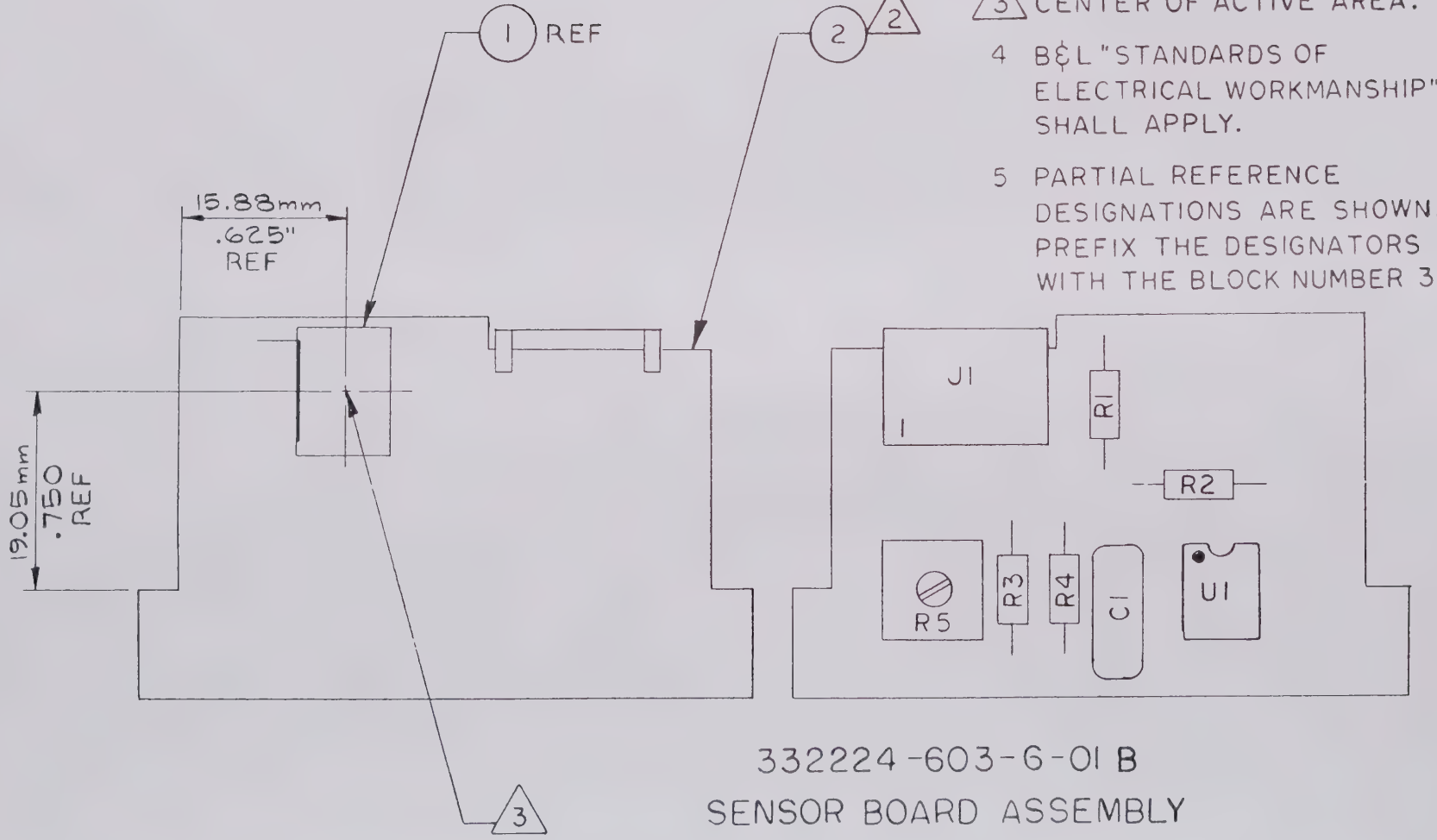
NOTES: UNLESS OTHERWISE SPECIFIED:
1 ALL RESISTOR VALUES ARE IN OHMS.
2 ALL CAPACITOR VALUES ARE IN MICROFARADS.
3 REFERENCE DESIGNATORS ARE PREFIX NUMBER 2.

D/A CONVERTER SCHEMATIC
332246-60001 A

NOTES:

UNLESS OTHERWISE SPECIFIED

1. DIMENSIONING PER CURRENT ANSI STANDARD Y14.5
2. CIRCUIT SIDE OF BOARD.
3. CENTER OF ACTIVE AREA.
4. B&L "STANDARDS OF ELECTRICAL WORKMANSHIP" SHALL APPLY.
5. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. PREFIX THE DESIGNATORS WITH THE BLOCK NUMBER 3.



332224-603-6-01 B

SENSOR BOARD ASSEMBLY

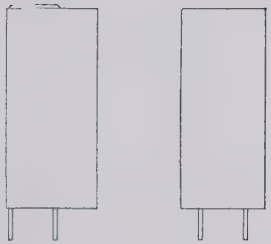
List of Parts for 332224-603-6-01
SENSOR BOARD ASSEMBLY

BAUSCH & LOMB

F

332224-603-6-02

Item No. Ref. Des.	B & L Part No.	Description	Item No. Ref. Des.	B & L Part No.	Description
C1	N344002-660	CAPACITOR, MICA 300PF + 5%, 500V ARCO #DM-15-301J			
J1	A332201-736	CONNECTOR, 4 PIN MOLEX #09-52-3041			
R1	S371951-661	RESISTOR, COMP., 100K 5% 1/4W			
R2	SAME AS R1				
R3	S371957-661	RESISTOR, COMP., $& OHM 5% 1/4W			
R4	S332224-646	RESISTOR, COMP., 1.2M 5% 1/4W			
U1	S333172-651	OPERATIONAL AMPLIFIER, HIGH PERFORMANCE, SIGNETICS µA741CV			
1	C332224-641	PHOTO SENSOR (REF)			
2	C332224-603-4	SENSOR P.W. BOARD ASS'Y			
R5	332223-643	TRIMPOT, 10K BECKMAN #72PR10K			

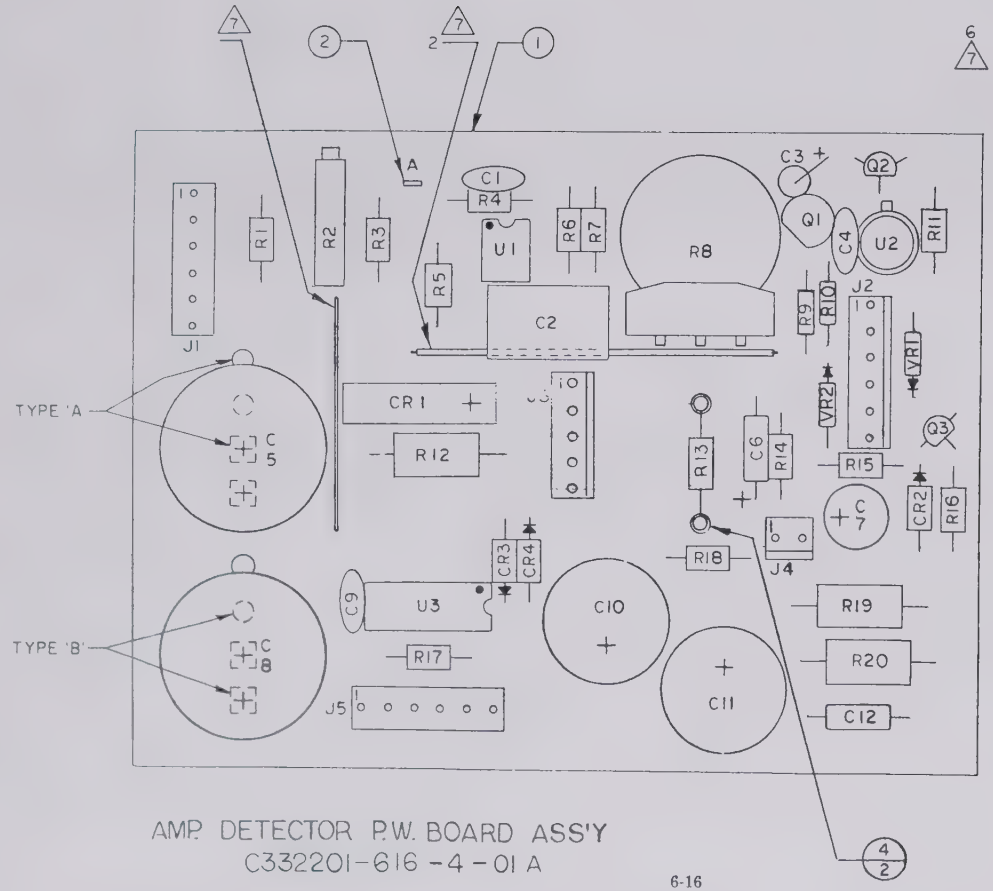


C5 & C8 MOUNTING CONFIGURATIONS

NOTES:

UNLESS OTHERWISE SPECIFIED

1. DIMENSIONING PER CURRENT ANSI STANDARD Y14.5
2. B&L "STANDARDS OF ELECTRICAL WORKMANSHIP" SHALL APPLY.
3. SQUARE LANDS DENOTE DESIGNATED FEATURE OF PART SHOWN.
4. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. PREFIX THE DESIGNATOR WITH BLOCK NUMBER 5.
5. R13 TO BE SELECTED FROM S-771, S-1021 THRU S-1047, S331001-661, S332680-641, S333060-657, S333060-683, S333060-702, S333060-707, S333060-734, S333060-882, S333060-893, S344001-678, S344001-867, AND S344001-876 THRU S344001-883 TO PROVIDE A LAMP VOLTAGE BETWEEN 5.9V. AND 6.3V. AT THE LAMP.
6. CEMENT C5, C8 WITH KD-228
7. PART OF ITEM 3.



AMP. DETECTOR P.W. BOARD ASS'Y
C332201-616-4-01 A

List of Parts for 332201-616-4-01
AMP/DETECTOR P.W. BOARD ASS'Y

BAUSCH & LOMB

332201-616-402

Item No. Ref. Des.	B & L Part No.	Description
C1	N333060-1061	CAPACITOR, DISC CERAMIC 150 PF ± 10%, 500V
C2	A332201-755	CAPACITOR, FILM .47 MFD ± 10%, 100V PAKTRON TYPE FM
C3	A332201-1054	CAPACITOR, TANT. RADIAL TYPE, 15 MFD ± 20%, 10V DICKSON TYPE GSD
C4	SAME AS C1	
C5	A332201-757	CAPACITOR, ELECT 3000 MFD -10%, + 100% 20V TEMPLE TYPE 411
C6	A332201-758	CAPACITOR, TANT. 1 MFD ± 20%, 10V DICKSON TYPE GSAX
C7	A332201- 759	CAPACITOR, ELECT. RADIAL TYPE, 68 MFD -20%, +100% 15V, TEMPLE TYPE 411
C8	SAME AS C5	
C9	N333097-650	CAPACITOR, DISC CERAMIC .1 MFD +80% -20% 10V CENTRALAB ULTRA-KAP
C10	A332201-760	CAPACITOR, ELECT. RADIAL TYPE, 220 MFD, -20% +100%, 60V TEMPLE TYPE 411
C11	SAME AS C10	
C12	N371952-654	CAP, FILM, .0047/200V
CR1	S382314-652	RECTIFIER, BRIDGE 4 AMP, 50V MOTOROLA #MDA970-1
CR2	S371930-681	DIODE, 1N270
CR3	S332201-748	DIODE. 1N4003
CR4	SAME AS CR3	
J1	A332201-744	WAFER, 6 PIN MOLEX # 09-64-1061
J2	S332201-1008	WAFER, 6 PIN, LOCKING MOLEX # 09-65-1061
J3	A332201-789	WAFER, 5 PIN POLARIZED MOLEX # 09-60-1051
J4	A332201-746	WAFER, 2 PIN POLARIZED MOLEX # 09-60-1021
J5	SAME AS J1	

DATE 1-17-77 ECO REV. LETTER A 50419	LIST OF PARTS FOR 332201-616-4-01 AMP/DETECTOR P.W. BOARD ASS'Y	BAUSCH & LOMB ▼	332201-616-403

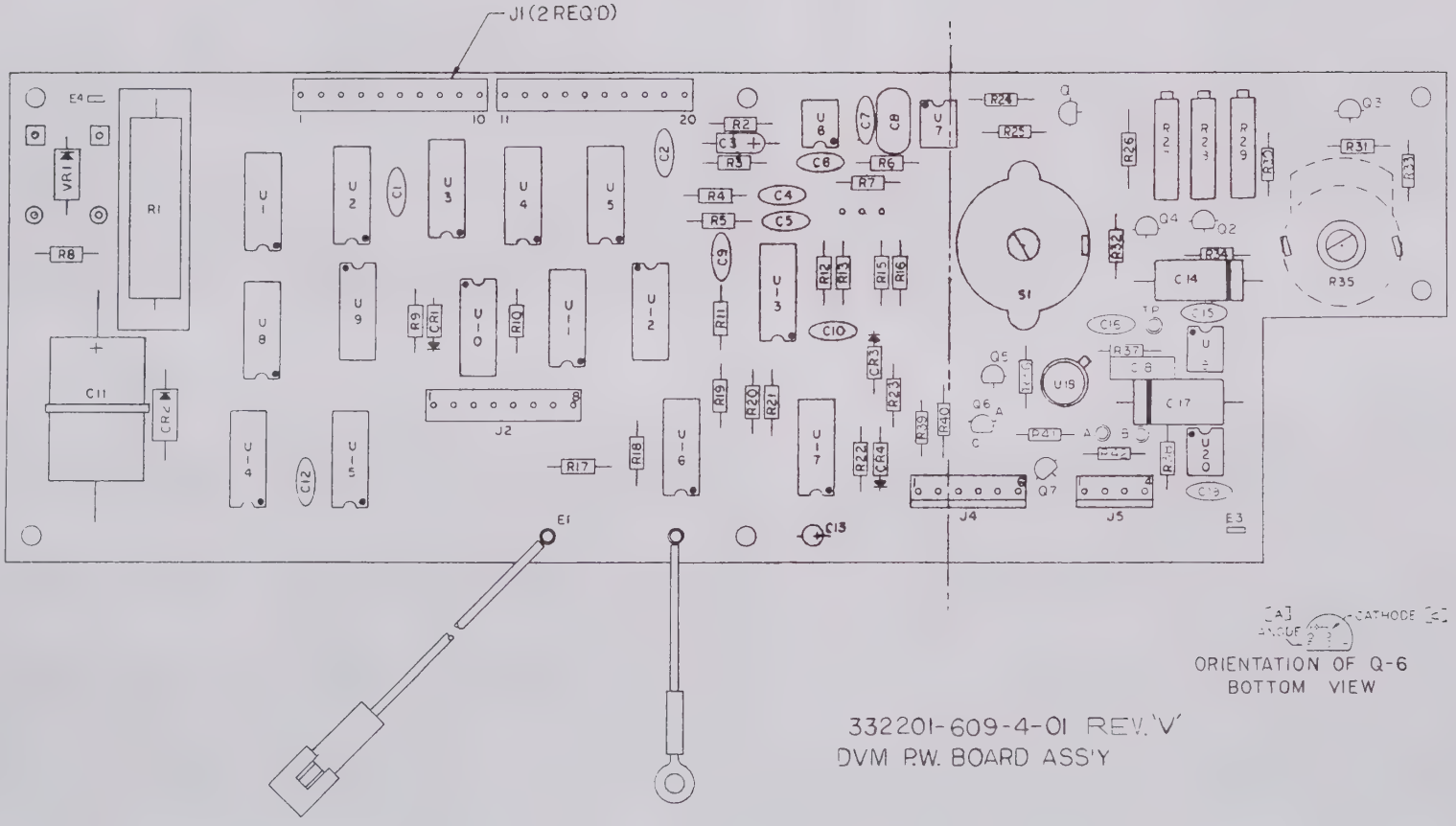
ITEM NO. REF. DES.	B&L PART NO.	DESCRIPTION
Q1	S333060-1029	TRANSISTOR, SELECTED
Q2	S332201-664	TRANSISTOR, 2N5555
Q3	S331011-647	TRANSISTOR, 2N3904
R1	S332201-1019	RESISTOR, COMP. 3.6K ± 5%, ¼ W
R2	S333060-784	POTENTIOMETER, 5K TRIMPOT
R3	S333083-642	RESISTOR, COMP.. 13K, ± 5%, ¼ W
R4	S332224-648	RESISTOR, CERMET 2.4M ±1%, ¼ W
R5	S333060-659	RESISTOR, METAL FILM 12.1K ± 1% ¼ W
R6	S344001-867	RESISTOR, METAL FILM 3.01K ±1% ¼ W
R7	S344002-929	RESISTOR, COMP., 2.2M, ±5%, ¼ W
R8	C332201-750	POTENTIOMETER, .50K
R9	S371952-647	RESISTOR, COMP., 27K, ±5%, ¼ W
R10	S371952-650	RESISTOR, COMP, 33K, ±5%, ¼ W
R11	S371951-661	RESISTOR, COMP., 100K, ±5%, ¼ W
R12	A333172-731	RESISTOR, WIRE WOUND .15 OHMS ±5%, ¼ W
R13	SEE NOTE	
R14	S371957-666	RESISTOR, COMP., 4.7K, ±5%, ¼ W
R15	S371951-651	RESISTOR, COMP., 2.7K, ± 5%, ¼ W
R16	S371951-648	RESISTOR, COMP., 3.3K ±5%, ¼ W
R17	S342501-1495	RESISTOR, COMP., 1K, ±5%, ¼ W
R18	S371957-651	RESISTOR, COMP., 470 OHMS ± 5%, ¼ W
R19	A332201-749	RESISTOR, WIRE WOUND 680 OHMS ±5%, 4 W
R20	SAME AS R19	

LIST OF PARTS FOR 332201-616-4-01
AMP/DETECTOR P.W. BOARD ASS'Y

BAUSCH & LOMB

332201-616-404

ITEM NO. REF. DES.	B&L PART NO.	DESCRIPTION	ITEM NO. REF. DES.	B&L PART NO.	DESCRIPTION
U1	S333172-651	OPERATIONAL AMPLIFIER HIGH PERFORMANCE SIGNETICS # UA741CV			
U2	S333070-745	OPERATIONAL AMPLIFIER LM301AH, NAT. SEMI.			
U3	S332201-1053	PRECISION VOLTAGE REG. FAIRCHILD UA723DC OR SILICON GEN. # SG723CN			
VR1	S332201-673	ZENER DIODE, 15V, 1 W 1N4744A			
VR2	SAME AS VR1				
1	D332201-616-3	AMP/DETECTOR P.W. BD			
2	N344001-718	TERMINAL, QUICK - CONNECT, AMP # 61134-1			
3	B332201-1649	WIRE ASS'Y			
4	N332501-659	TERMINAL. TURRET, CAMBRIDGE # 1558-2			



ORIENTATION OF Q-6
BOTTOM VIEW

332201-609-4-01 REV. 'V'
DVM P.W. BOARD ASS'Y

Date 11-18-74 2-27-76 Rev. Letter H ECO #50228	List of Parts for 332201-609-4-01 DVM BOARD ASSEMBLY	BAUSCH & LOMB	332201-609-402

Item No. Ref. Des.	B & L Part No.	Description
C1	N333097-650	CAPACITOR, DISC CERAMIC 1MFD 10V, CENTRALAB ULTRA-KAP
C2	SAME AS C1	
C3	A332201-779	CAPACITOR, TANT., 1.5MFD 10V, DICKSON TYPE GSAX
C4	N333040-665	CAPACITOR, DISC CERAMIC 100PF 500V
C5	N371951-681	CAPACITOR, DISC CERAMIC .01MFD 100V SPRAGUE TG-S10
C6	SAME AS C1	
C7	SAME AS C4	
C8	N332201-778	CAPACITOR, MICA, 750PF 500V ARCO #DM-15-751J
C9	SAME AS C1	
C10	N333060-1061	CAPACITOR, DISC CERAMIC 150PF 500V
C11	A332201-780	CAPACITOR, ELECTROLYTIC 20MFD 250V, CORNELL DUBILIER #BR20-250
C12	SAME AS C1	
C13	A332201-756	CAP, TANT, 12MFD 10V
C14	A332201-777	CAPACITOR, POLYCARBON 1MFD 50V ELPAC C5B105K
C15	A332201-774	CAPACITOR, DISC CERAMIC 10PF 100V
C16	N333060-1138	CAPACITOR, DISC CERAMIC 30PF 1000V
C17	N371951-641	CAPACITOR, TANT., 4.7MFD 10V KEMET TYPE T310
CR1	S371930-681	DIODE, 1N270
CR2	S333172-762	DIODE, AMPEREX BY -127
CR3	SAME AS CR1	
CR4	SAME AS CR1	
J1	A332201-762	WAFER, 10 PIN MOLEX #09-64-1106
J2	A332201-763	WAFER, 8 PIN MOLEX #09-64-1068
J3	A332201-787	WAFER, 3 PIN MOLEX #09-64-1031

Date Rev. Letter	List of Parts for 332201-609-401 DVM P.W. BOARD ASSEMBLY	BAUSCH & LOMB	332201-609-403

Item No. Ref. Des.	B & L Part No.	Description
J4	A332201-1008	WAFER, 6 PIN LOCKING MOLEX #09-65-1061
J5	S344002-994	WAFER, 4 PIN MOLEX #09-65-1041
Q1	A332201-791	TRANSISTOR, SELECTED
Q2	SAME AS Q1	
Q3	SAME AS Q1	
Q4	SAME AS Q1	
Q5	S371930-1300	TRANSISTOR, 2N3638A
Q6	S333060-1029	TRANSISTOR, SELECTED
Q7	S371951-663	TRANSISTOR, 2N3643
R1	A332201-772	RESISTOR, WW, 5K, 5%, 7W TEL LAB #EL7AV
R2	S333060-891	RESISTOR, COMP., 470K 10%, 1/4W
R3	S333060-668	RESISTOR, COMP., 4.7K 10%, 1/4W
R4	S371935-641	RESISTOR, COMP., 10K, 10%, 1/4W
R5	SAME AS R3	
R6	SAME AS R4	
R7	S371935-643	RESISTOR, COMP., 680 OHM, 10%, 1/4W
R8	S332201-783	RESISTOR, COMP., 390K 10%, 1/4W
R9	S333060-712	RESISTOR, COMP., 1K 10%, 1/4W
R10	SAME AS R9	
R11	SAME AS R9	
R12	SAME AS R4	
R13	SAME AS R4	
R15	SAME AS R3	
R16	SAME AS R3	
R17	SAME AS R9	
R18	SAME AS R9	
R19	SAME AS R9	
R20	SAME AS R3	

Date Rev. Letter	List of Parts for 332201-609-4-01 DVM P.W. BOARD ASSEMBLY	BAUSCH & LOMB	332201-609-404

Item No. Ref. Des.	B & L Part No.	Description	Item No. Ref. Des.	B & L Part No.	Description
R21	S371935-642	RESISTOR, COMP., 2.7K, 10%, 1/3W	R33	S333060-684	RESISTOR, METAL FILM, 9.09K, 1%, 1/4W
R22	SAME AS R9		R34	S333001-646	RESISTOR, COMP., 27K 10%, 1/4W
R23	SAME AS R21		R35	D332201-765	POTENTIOMETER
R24	S344001-691	RESISTOR, METAL FILM, 1K, 1%, 1/4W	R36	SAME AS R3	
R25	S332201-771	RESISTOR, METAL FILM, 5.76K, 1%, 1/4W	R37	SAME AS R4	
R26	S344001-877	RESISTOR, METAL FILM, 4.32K, 1%, 1/4W	R38	SAME AS R34	
R27	S343170-666	TRIMPOT, 10K, CTS TYPE 190P	R39	SAME AS R32	
R28	S371950-658	TRIMPOT, 100 OHM, CTS TYPE 190P	R40	S332201-770	RESISTOR, METAL FILM, 2617K, 1%, 1/4W
R29	S333060-750	TRIMPOT, 2K, CTS, TYPE 190T	R41	SAME AS R4	
R30	SAME AS R3		R42	SAME AS R4	
R31	SAME AS R9		S1	D332201-764	SWITCH, 4P-3POS.
R32	S333060-720	RESISTOR, COMP., 100K 10%, 1/4W	U1	S382314-659	QUADRUPLE BISTABLE LATCH, TEXAS INSTRUMENT #SN7475N
			U2	S333040-651	DECADE COUNTER, MOTOROLA #MC7490P

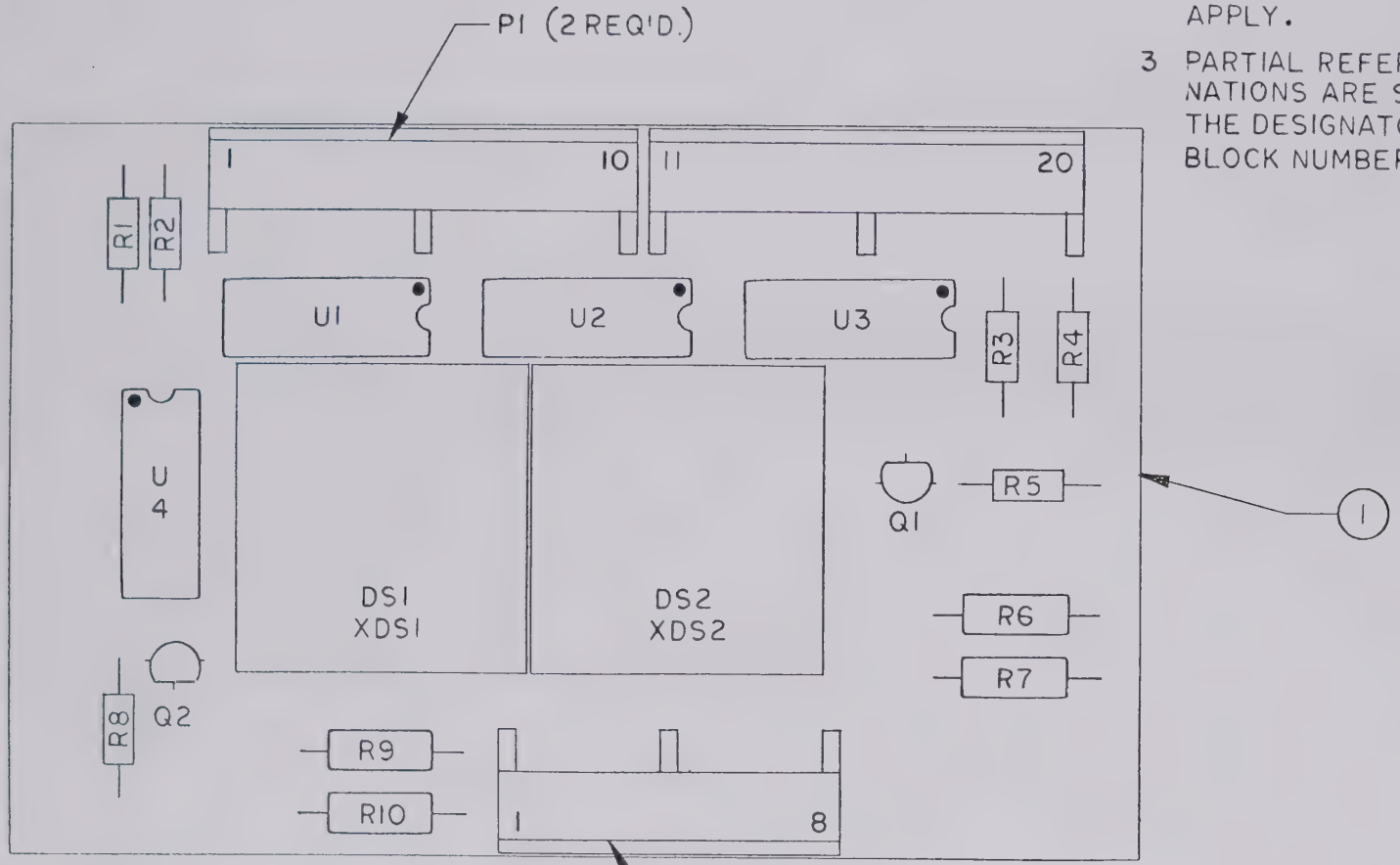
Date Rev. Letter	List of Parts for 332201-609-4-01 DVM P.W. BOARD ASSEMBLY	BAUSCH & LOMB	332201-609-405

Item No. Ref. Des.	B & L Part No.	Description
U3	SAME AS U1	
U4	SAME AS U2	
U5	SAME AS U1	
U6	S344002-652 #NE555V	TIMER, SIGNETICS
U7	SAME AS U6	
U8	SAME AS U1	
U9	S372069-651	TRIPLE 3-INPUT POSITIVE NAND GATE, SIGNETICS #N7410A
U10	S371951-664	QUAD. 2-INPUT POSITIVE NAND GATE, SIGNETICS #N7400A
U11	S343170-774	HEX INVERTER, TEXAS INSTRUMENTS #SN74004N
U12	SAME AS U2	
U13	SAME AS U10	
U14	SAME AS U2	
U15	S372069-641	QUAD. 2-INPUT POSITIVE NOR GATE, SIGNETICS #N7402A
U16	SAME AS U9	
U17	S371957-659	QUAD. 2-INPUT POSITIVE NAND GATE, HIGH SPEED SIGNETICS N74H00
U18	S333070-745	OPERATIONAL AMPLIFIER, NATIONAL SEMICONDUCTOR #LM301A
U19	S332201-790	OPERATIONAL AMPLIFIER MOTOROLA #MC1709CPI
U20	A333172-651	OPERATIONAL AMPLIFIER HIGH PERFORMANCE SIGNETICS #μA741CV
VR1	S332201-1001	ZENER DIODE, IN5386A 180V, 5W
1	D332201-609-3	DVM P.W. BOARD
2	N344001-718	TERMINAL, QUICK CONNECT AMP #61134-1
3	N332501-659	TERMINAL, TURRET CAMBRIDGE #1558-2
9	N333172-655	STA-STRAP, PANDUIT #SST1.5M
10	B332201-1634	WIRE ASSEMBLY

NOTES:

UNLESS OTHERWISE SPECIFIED

1. DIMENSIONING PER CURRENT ANSI STANDARD Y14.5
2. B&L "STANDARDS OF ELECTRICAL WORKMANSHIP" SHALL APPLY.
3. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN PREFIX THE DESIGNATORS WITH THE BLOCK NUMBER 8.

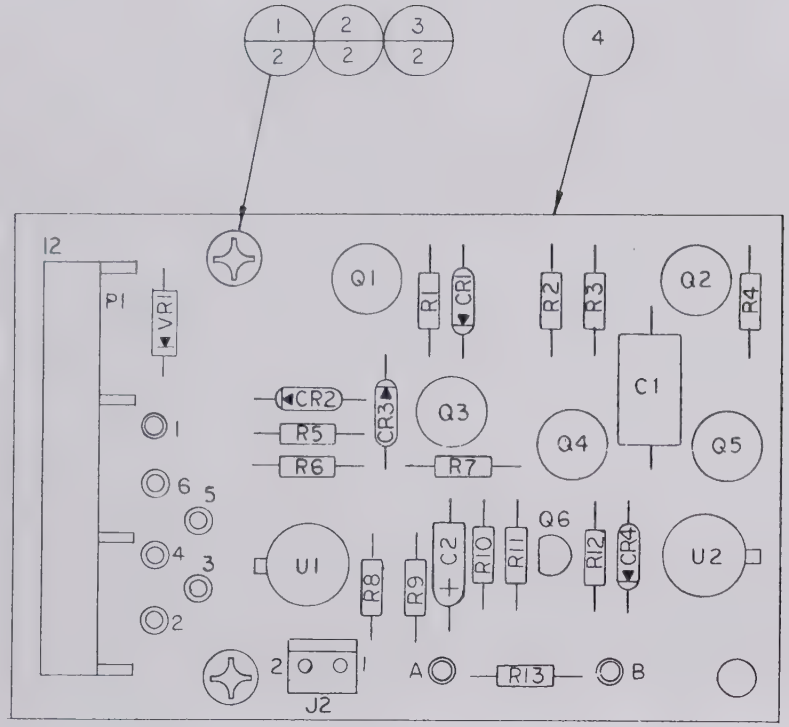


332201-608-4-01 A

DISPLAY P.W. BOARD ASS'Y

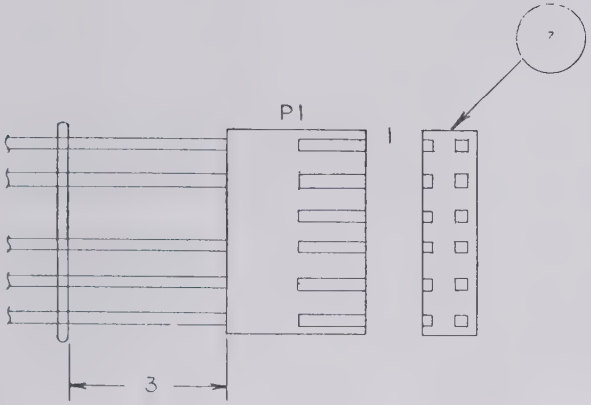
Date 12-9-74 ECO Rev. Letter C 37153	List of Parts for 332201-608-401 DISPLAY P.W. BOARD ASSEMBLY	BAUSCH & LOMB	332201-608-402

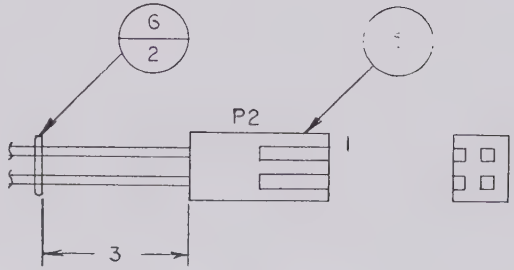
Item No. Ref. Des.	B & L Part No.	Description
DS1	C332201-1000	DISPLAY, SPERRY #SP-352
DS2	SAME AS DS1	
P1	A344902-748	CONNECTOR, 10 PIN MOLEX #09-52-3102
P2	A332201-784	CONNECTOR, 8 PIN MOLEX #09-52-3082
Q1	N333060-1166	TRANSISTOR, 2N5550
Q2	SAME AS Q1	
R1	S332201-735	RESISTOR, COMP, 11K5% 1/4W
R2	SAME AS R1	
R3	SAME AS R1	
R4	SAME AS R1	
R5	S333060-873	RESISTOR, COMP., 22K 10% 1/4W
R6	S332882-203	RESISTOR, COMP., 2.2K 10% 1/2W
R7	SAME AS R6	
R8	SAME AS R5	
R9	SAME AS R6	
R10	SAME AS R6	
U1	A332201-732	DECODER/DRIVER SPERRY #DD-700
U2	SAME AS U1	
U3	SAME AS U1	
U4	SAME AS U1	
XDS1	B332201-799	SOCKET, SPERRY #CS-352
XDS2	SAME AS XDS1	
1	C332201-608-3	DISPLAY P.W. BOARD



8

FROM	COLOR	TO
P1-6	BLU	PWB-3
-5	RED	PWB-1
-4	GRN	PWB-2
-3	NC	NC
-2	ORN	PWB-6
P1-1	YEL	PWB-5
P2-2	BLK	PWB-B
P2-1	WHT/RED	PWB-A





D/A CONVERTER

C332246-602-4-01C

F

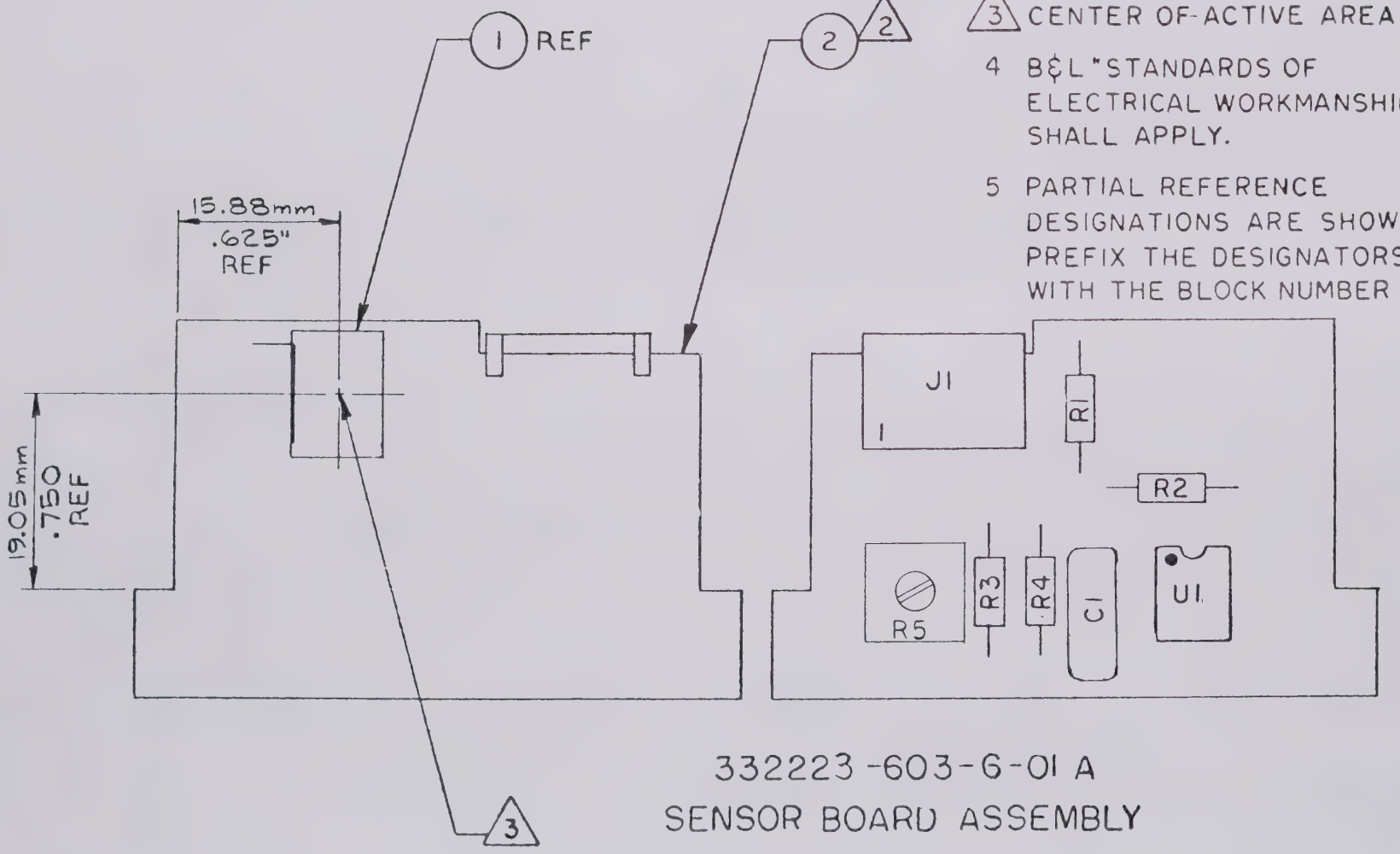
Date 4-7-75	List of Parts for	BAUSCH & LOMB	332246-602-402
Rev. Letter A	D/A CONVERTER BOARD ASSY		

Item No. Ref. Des.	B & L Part No.	Description	Item No. Ref. Des.	B & L Part No.	Description
1	S342501-1206	SCR., 6-32 x 5/8 LG.			
2	S332246-101	SPACER, 1/4 OD x 9/16 ID 3/8 LG. NYLON			
3	S332979-233	6-32T KEPS NUT			
4	B344024-602401	PW BOARD ASSEMBLY			
5	S332201-719	CONNECTOR			
6	N333040-969	PANDUIT # SSTIM			
7	S332225-660	CONNECTOR			
8	B332246-1601	WIRE ASSEMBLY			

NOTES:

UNLESS OTHERWISE SPECIFIED

1. DIMENSIONING PER CURRENT ANSI STANDARD Y14.5
2. CIRCUIT SIDE OF BOARD.
3. CENTER OF-ACTIVE AREA.
4. B&L "STANDARDS OF ELECTRICAL WORKMANSHIP" SHALL APPLY.
5. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. PREFIX THE DESIGNATORS WITH THE BLOCK NUMBER 3.



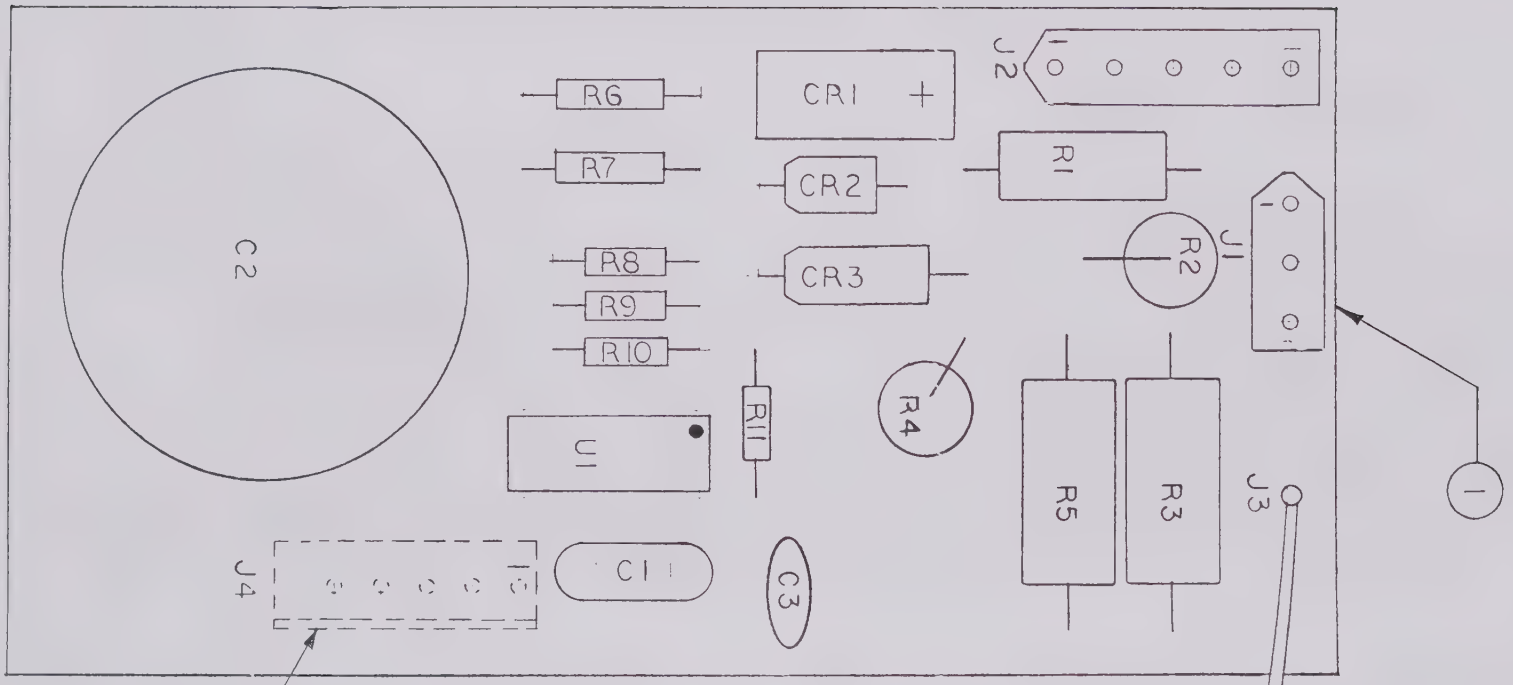
332223-603-6-01 A

SENSOR BOARD ASSEMBLY

F

Date 10-18-73 ECO Rev. Letter B 37738	List of Parts for 332223-603-6-01 SENSOR BOARD ASSEMBLY	BAUSCH & LOMB	332223-603-6-02

Item No. Ref. Des.	B & L Part No.	Description	Item No. Ref. Des.	B & L Part No.	Description
C1	N371960-650	CAPACITOR, MICA, 82PF ± 5% 500V, LM375-28			
J1	A332201-736	CONNECTOR, 4 PIN MOLEX #09-52-3041			
R1	S371951-661	RESISTOR, COMP., 100K 5% 1/4W			
R2	SAME AS R1				
R3	S371957-661	RESISTOR, COMP., 47 OHM 5% 1/4W			
R4	S332223-645	RESISTOR, COMP., 3.9M 5% 1/4W			
R5	A332223-643	TRIMPOT, 10K, BECKMAN #72PR10K			
U1	S333172-651	OPERATIONAL AMPLIFIER, HIGH PERFORMANCE, SIGNETICS µA741CV			
1	C332223-644	PHOTO SENSOR (REF)			
2	C332223-603-4	SENSOR P.W. BOARD ASS'Y			



NOTES:

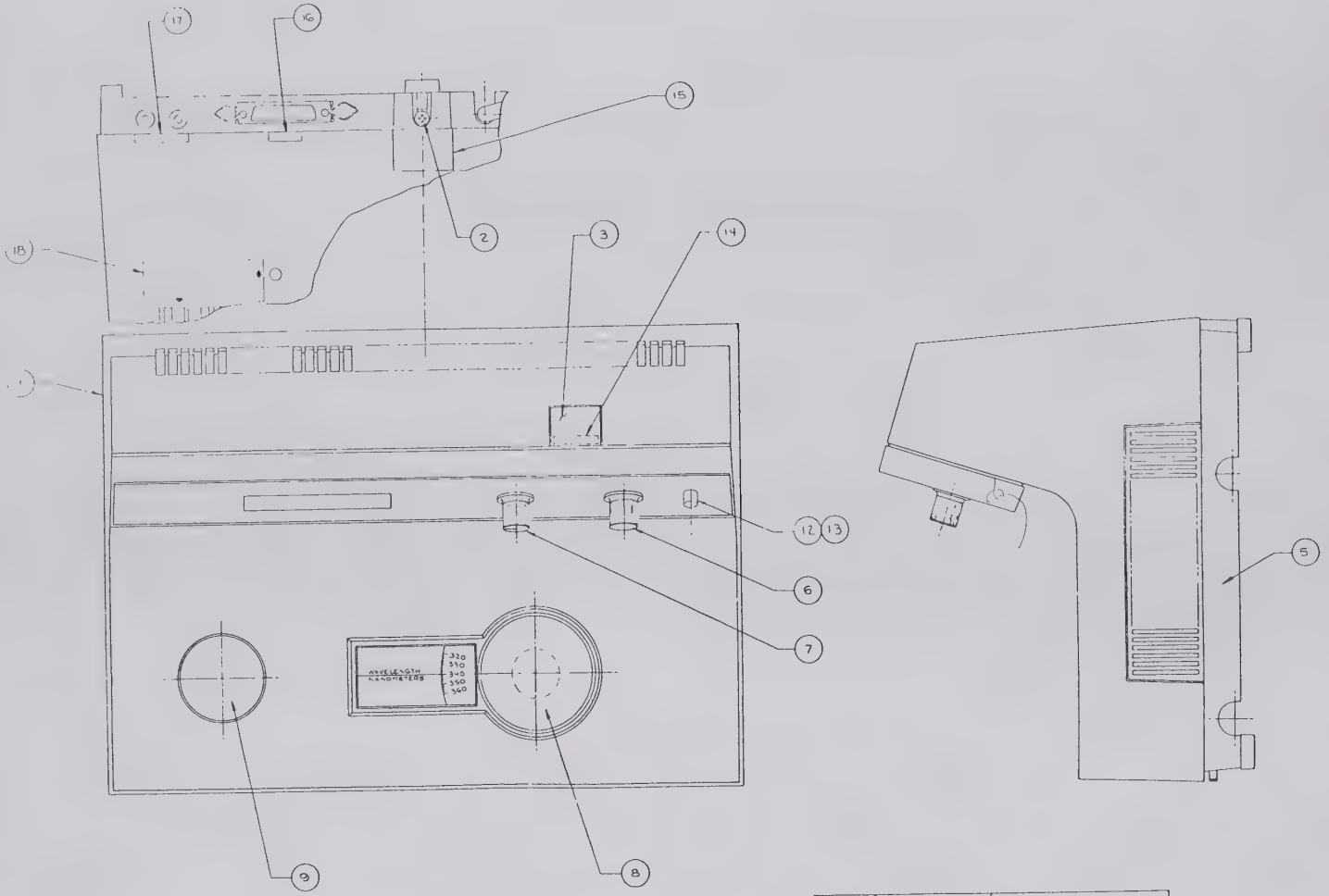
UNLESS OTHERWISE SPECIFIED

1. B&L "STANDARDS OF ELECTRICAL WORKMANSHIP" SHALL APPLY.
2. SQUARE LANDS DENOTE DESIGNATED FEATURE OF PART SHOWN.
3. PARTIAL REF. DES. ARE SHOWN. PREFIX THE DES. WITH BLOCK NUMBER 2.
4. MOUNT R2 AND R4 FLUSH TO BOARD.

UV POWER SUPPLY B.D. ASS'Y.
332225-602-4-01

Date Rev. Letter	List of Parts for 332225-602-4-01 UV POWER SUPPLY BOARD ASSEMBLY	BAUSCH & LOMB	332225-602-402

Item No. Ref. Des.	B & L Part No.	Description
C1	N333060-1061	CAPACITOR, DISC CERAMIC 150PF ± 10% RMC TYPE JG
C2	A332225-650	CAPACITOR, ELECTROLYTIC 400 MFD 200V MALLORY TYPE PFP
CR1	S332225-651	BRIDGE RECTIFIER, M DA 942A-3
CR2	S342501-684	DIODE F4
CR3	S333172-762	DIODE, AMPEREX BY-127
J1	N344001-716	WAFER, 3-PIN, MOLEX 1840-3
J2	N333083-740	WAFER, 5-PIN, MOLEX 1840-5
J3	N333070-748	TERMINAL AMP #60599-1
J4	A332225-646	WAFER, 6-PIN, MOLEX 09-60-1061
R1	S33225-647	RES, COMP, 5.6 OHM 10% 1W
R2	S332881-342	RES. COMP, 39K, 10% 2W
R3	S332881-347	RES. COMP, 22K, 10% 2W
R4	S332225-648	RES. COMP 6.8 OHN 10% 2W
R5	S332225-649	RES. COMP 10HM 10% 2W
R6	S344001-876	RES. COMP RN60 4.12K 1% 1/4W
R7	S344001-867	RES. COMP RN60, 3.01K 1% 1/4W
R8	S371955-647	RES. COMP 1.8K 5% 1/4W
R9	S371951-659	RES. COMP 27 OHM 5% 1/4W
R10	SAME AS R8	
U1	S332201-1053	PRECISION VOLTAGE REGULATOR FAIRCHILD UA723DC OR SILICON GENERAL #SG723CN
1	C332225-602-3	UV POWER SUPPLY BOARD
2	B332225-1613	WIRE ASSEMBLY
C3	S333097-642	CAP. TANT 1MFD ± 10% 20V KEMET T362
R11	S371957-650	RES. 1.5K ± 5% 1/4W

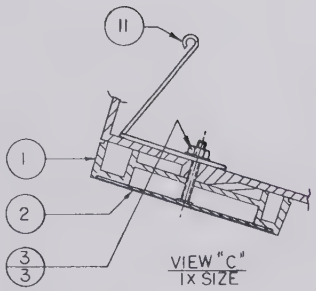


E - 332201 - 200 H
MAIN ASSEMBLY

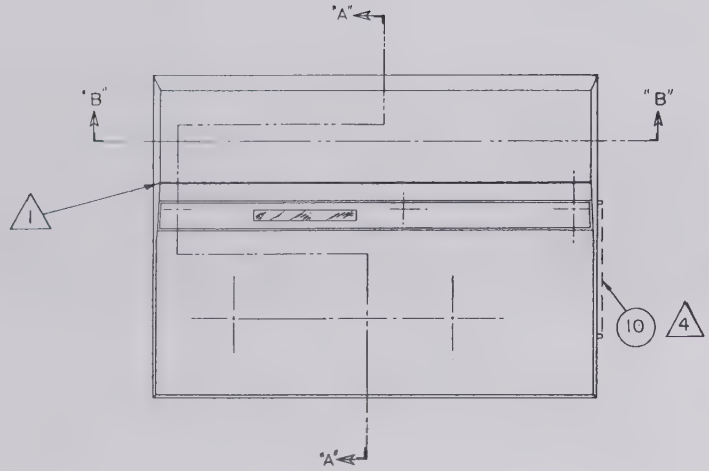
ITEM NO REF. DES.	B & L PART NO.	DESCRIPTION
18	B332201-347	LABEL
17	B332201-309	LABEL
16	B332201-308	LABEL
15	B332201-311	LABEL
14	B332201-307	LABEL
13	B332201-278	EXTENSION
12	A332201-314	KNOB
9	B332206-200	MAIN ASSY
8	B332201-153	KNOB ASSY
7	B332201-212	KNOB ASSY
6	B332201-213	KNOB ASSY
5	R332201-5001	BASE ASSY
3	B332201-241	PLUG
2	5333083-167	SCREW #8 x 1/2 TYPE AB
1	D332201-170	COVER ASSY

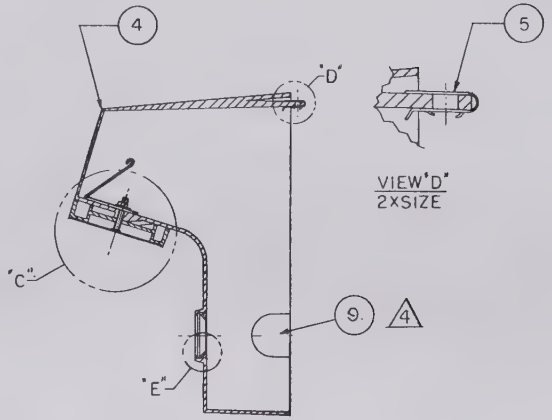
NOTES:
UNLESS OTHERWISE SPECIFIED

1. GAP TO BE UNIFORM WITHIN ±.25mm (.010") ALONG TOP AND SIDES.
2. CEMENT WITH CLEAR RTV AFTER WRAPING WITH MASKING TAPE.
3. CEMENT WITH NEOPRENE F-1
4. CEMENT WITH CLEAR RTV



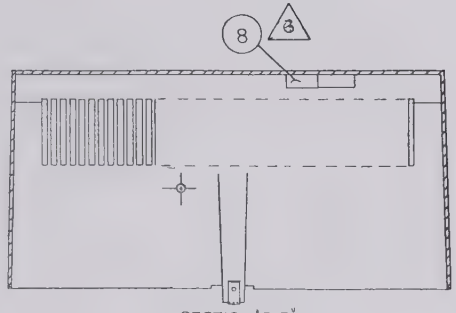
VIEW "C"
1X SIZE



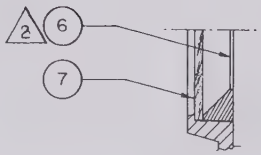


VIEW "D"
2XSIZE

SECTION "A-A"



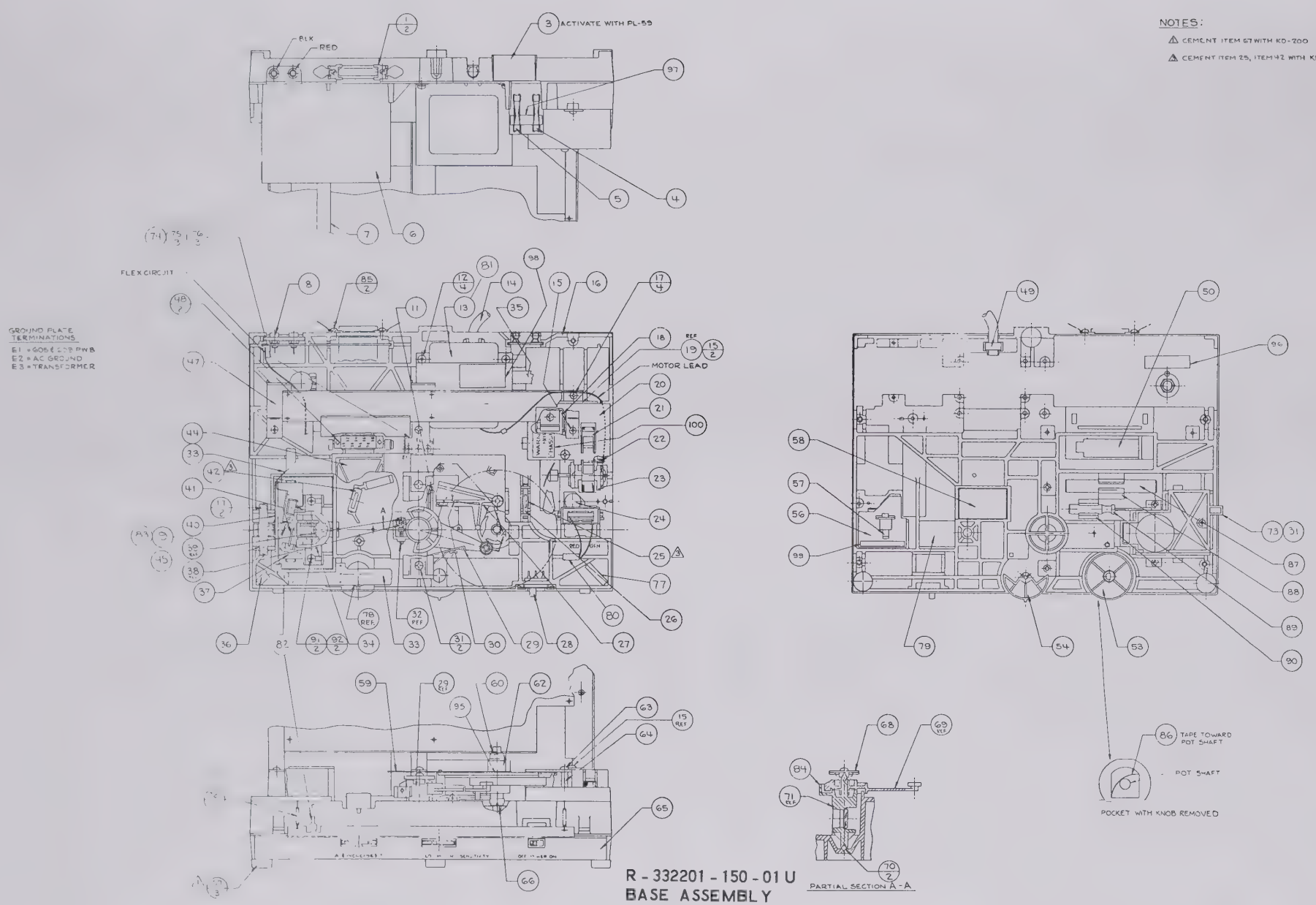
SECTION "B-B"



VIEW "E"
2XSIZE

ITEM NO. REF. DES.	B+L PART NUMBER	DESCRIPTION
11	C332201-325	GROUND STRAP
10	D332201-125	DOOR
9	B332201-184	PLUG
8	B332201-266	PAD
7	B332201-138	WINDOW
6	C332201-142	RETAINER
5	S332201-268	CLIP, TINNERMAN *CI7721-8A-4
4	E332201-124	COVER
3	S332979-233	6-32 KEPS NUT
2	B332201-240	INSERT ASSY
1	C332201-235	BEZEL

D332201-170F
COVER ASSY



R-332201-150-01U
BASE ASSEMBLY

Date 9-11-75 ECO Rev. Letter D 50088	List of Parts for 332201-15001 BASE ASS'Y.	BAUSCH & LOMB	332201-15002

Item No. Ref. Des.	B & L Part No.	Description	Item No. Ref. Des.	B & L Part No.	Description
1	A332201-344	LATCH & SPRING ASS'Y	17	S333172-119	#6 SELF TAP X 1/2 LG.
			18	B332201-223	SYNC. DET. ASS'Y
3	B332201-179	ELEC. PLATE	19	C332201-724	HEAT SINK ASS'Y
4	S332879-101	FUSE, 2ASB 125V	20	C332201-106	HEAT SINK
5	S333172-707	FUSE, .7ASB 250V	21	B332201-232	MOTOR SHIELD
6	C332201-605-401	PW. BD. ASS'Y	22	S332201-244	9/64 DIA. DOWELING X 1 LG.
7	B332201-612-4	FLEX CIRCUIT ASS'Y	23	B332201-681	MOTOR ASS'Y
8	B332201-676	OUTPUT JACK ASS'Y	24	B333307-602-4	PW. BD. ASS'Y
9	S332201-249	#4 SELF TAP X 1/2 LG.	25	B332201-028	CONDENSER LENS
			26	B332201-224	SPRING
11	B332201-275	ENTRANCE SLIT	27	B332201-254	SPRING
12	S333172-118	#8 SELF TAP X 1/2 LG.	28	B332201-731	SWITCH ASS'Y
13	C332201-679	TRANSFORMER ASS'Y	29	C332201-301	SPRING, TORSION
14	B332201-677	POWER CORD ASS'Y	30	B332201-146	FILTER MOUNT ASS'Y
15	S332201-250	#6 SELF TAP X 3/8 LG.	31	S342501-473	8 - 32T X 3/8 LG
16	R332201-105	BASE	32	S332201-246	6 - 32 T X 3/8 LG

Date Rev. Letter	List of Parts for 332201-15001	BAUSCH & LOMB	332201-15003

Item No. Ref. Des.	B & L Part No.	Description
33	D332201-614-4	FLEX CIRCUIT ASS'Y
34	B332201-152	EXIT SLIT ASS'Y
35	B332201-607-4	FLEX CIRCUIT ASS'Y
36	A332201-269	PAD
37	B332201-204	SENSOR COVER
38	A332201-189	SPRING
39	S332201-285	GROOV-PIN 3/64 DIA. X 5/16 LG
40	C332201-203	SHROUD
41	C332224-6-3-601	SENSOR ASS'y
42	B332201-193	MIRRO MT. ASS'Y
43		
44	D332201-119	MONO COVER
45	B332201-257	SPRING
46		
47	C232201-1007	BD. & BRK. ASS'Y
48	S343022-270	4 - 4-T X 3/8/LG
49	B332201-289	TY-RAP
50	B332201-219	GUARD ASS'Y
53	N332201-292	KNOB ASS'Y
54	N332201-291	KNOB ASS'Y
56	D332201-201	PLATE
57	B332201-202	KEY
58	B332201-180	COVER
59	B332201-283	INDEX PLATE ASS'Y
60	S3329259-136	TRUARC S103-31 MD
62	B332201-158	CAM ASS'Y
63	S332201-245	8 - 32 X 2 3/4 LG
64	A332201-207	SPACER

Date Rev. Letter F	List of Parts for 332201-15001 BASE ASS'Y.	BAUSCH & LOMB	332201-15004

Item No. Ref. Des.	B & L Part No.	Description
65	C332201-227	FRONT PLATE
66	A332201-312	WASHER
67	S332201-209	FOOT
68	332201-329	STRAP ASS'Y
69	D332201-102	FOLLOWER
70	S332201-165	.1875 DIA. STAINLESS BALL
71	B332201-148	GRATING ASS'Y
72	A332201-260	SPRING
73	B332201-273	BASE COVER ASS'Y
74	B332225-157	GROUND PLATE
75	S344001-305	6 - 32T x 1/4 LG
76	S332501-1181	#6 EXT. TOOTH LOCKWASHER
77	A332201-270	PAD
78	A332201-271	CAP
79	B332201-315	PLATE
80	A332201-279	TINNERMAN
81	B332201-286	INSULATOR
82	B332201-1625	WIRE ASS'Y
83	S332201-293	STANDOFF
84	B332201-28801	GRATING ASS'Y
85	S214325-379	#4 SELF TAP 3/8 LG SCREW
86	B332201-300	SPRING ASS'Y
87	A332201-316	OCCLUDER
88	A332201-320	CLIP
89	A332201-317	SCREW DRIVER
90	A332201-319	CLIP
91	S338640-190	WASHER #10
92	S334558-401	#8 - 32T X 1/2 LG. SCR.
93		
94		
95	B332201-267	WASHER

Date
Rev. Letter

List of Parts for 332201-15001

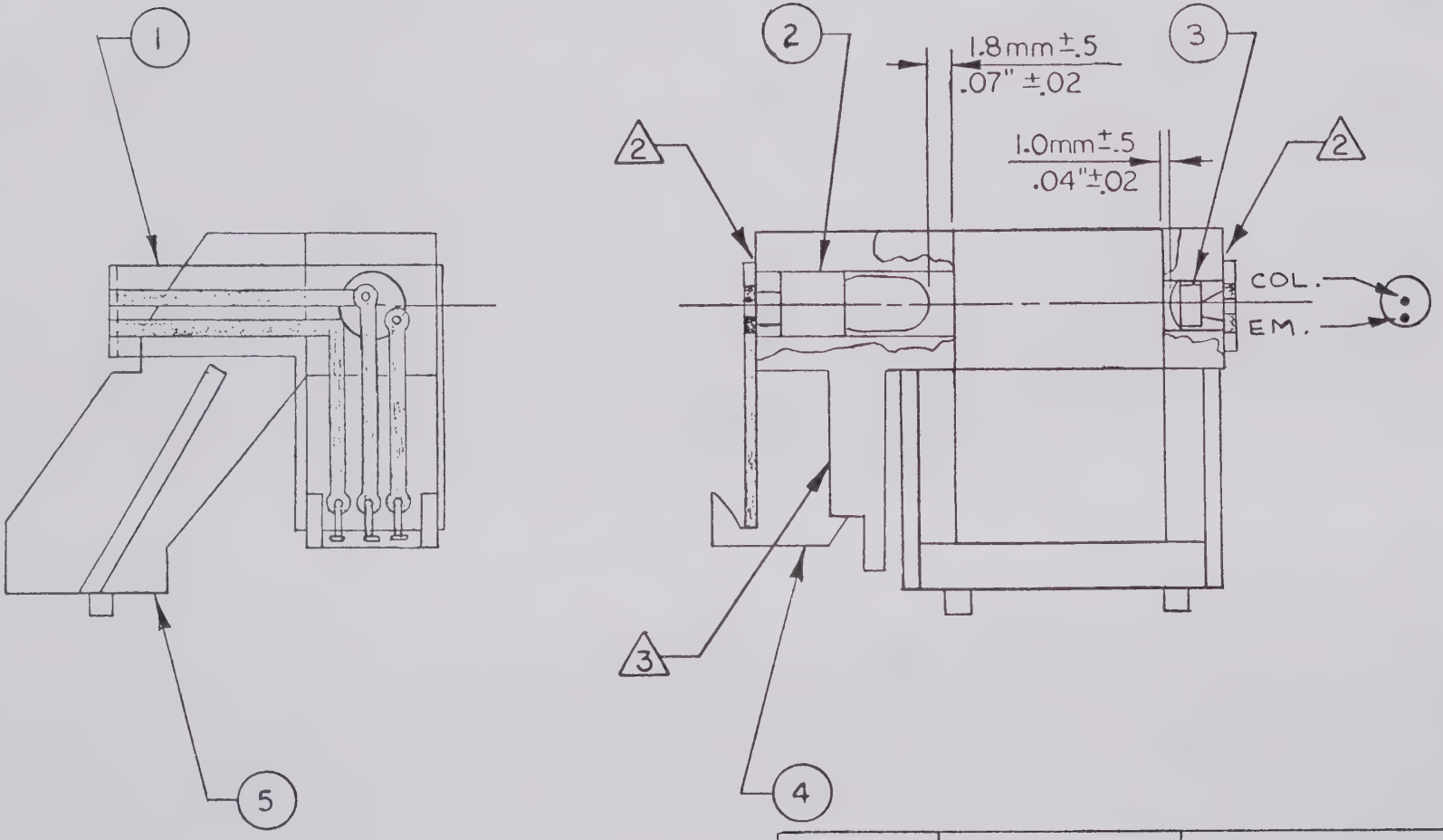
BAUSCH & LOMB

332201-15005

Item No. Ref. Des.	B & L Part No.	Description	Item No. Ref. Des.	B & L Part No.	Description
96	B332201-310	LABEL			
97	B332201-330	LABEL			
98	B333083-163	LABEL			
99	B332225-273	LABEL			
100	B332201-135	LABEL			

(2) CEMENT ITEMS 2 AND 3 IN PLACE WITH KD-197-KD-198.

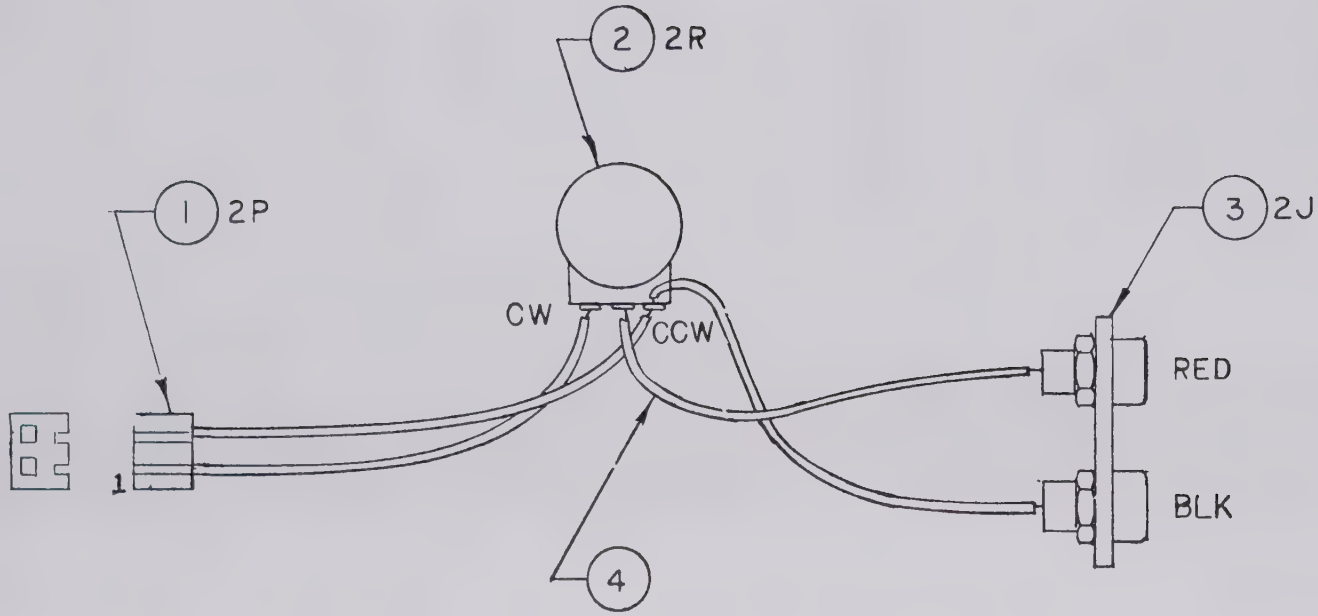
(3) CEMENT ITEM# 4 TO ITEM# 5 WITH KD-197-KD-198.



ITEM NO	B&L PART NO	DESCRIPTION
5	D332201-114	DIODE MOUNT
4	A332201-711	CONNECTOR
3	A332201-648	N-P-N SIL PHOTO TRANSISTOR
2	A332201-647	LAMP
1	B332201-606-3	FLEX CIRCUIT

SYNC DET ASS'Y
B332201-223 REV. D

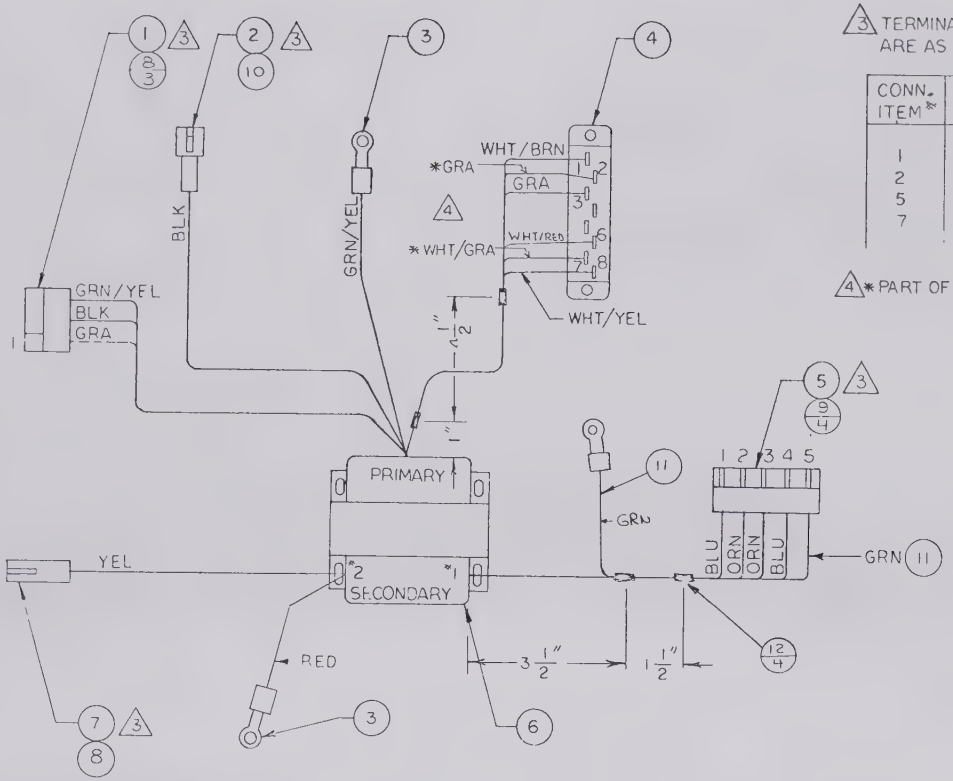
(2) PART OF B-1619 WIRE ASS'Y.



OUTPUT JACK ASSY
B332201-676 REV C

(2) ITEM	COLOR	FROM	TO
1	RED	2R-SL	2J-R
2	BLK	2R-CCW	2J-B
3	WHT/RED	2R-CW	2P-1
4	BLK	2R-CCW	2P-2

ITEM NO	B&L PART NO	DESCRIPTION
4	B332201 1619	WIRE ASSY
3	B332201 689	RECEPTACLE
2	B332201 720	POT
1	A332201-719	CONNECTOR



△3 TERMINALS USED IN CONNECTORS ARE AS FOLLOWS:

CONN. ITEM *	TERM. ITEM *	UNIT
1	8	3
2	10	1
5	9	4
7	8	1

△4 * PART OF ITEM *4

COLOR	LG.	STRIP-TIN	TERM. EYE	CONN.
BLK	4"	1/4	*5	*1
GRA	4"	1/4	*8	*1
GRN/YEL	4"	1/4	*8	*1
GRN/YEL	4"	1/4	*3	—
BLK	4"	1/4	*10	*2
WHT/YEL	7"	1/4 (T)	—	CONNECT TO SWITCH
WHT/RED	7"	1/4 (T)	—	
WHT/BRN	7"	1/4 (T)	—	
GRA	7"	1/4 (T)	—	
ORN	6"	1/4	*5	*5
ORN	6"	1/4	*9	*5
BLU	6"	1/4	*5	*5
BLU	6"	1/4	*9	*5
YEL	8"	1/4	*8	*7
RED	18"	1/4	*3	—

C332201-679 D
TRANSFORMER ASS'Y

ITEM NO.	B+L PART NO.	DESCRIPTION
12	N333040 969	PANDUIT SST1M
11	B332201-1628	WIRE ASSY
10	S370302-765	TERM MOLEX 1350
9	A332201-721	TERM
8	S333083-658	TERM MOLEX 1351
7	A332201-728	RECEPTACLE
6	C332201-727	TRANSFORMER
5	A332201-729	CONNECTOR
4	B332201-604-6	FUSE BD. ASS'Y
3	N532364-196	TERM ETC AA-232 OGX-T
2	A332201-725	CONNECTOR
1	N332650-1302	CONN MOLEX 1396R-1

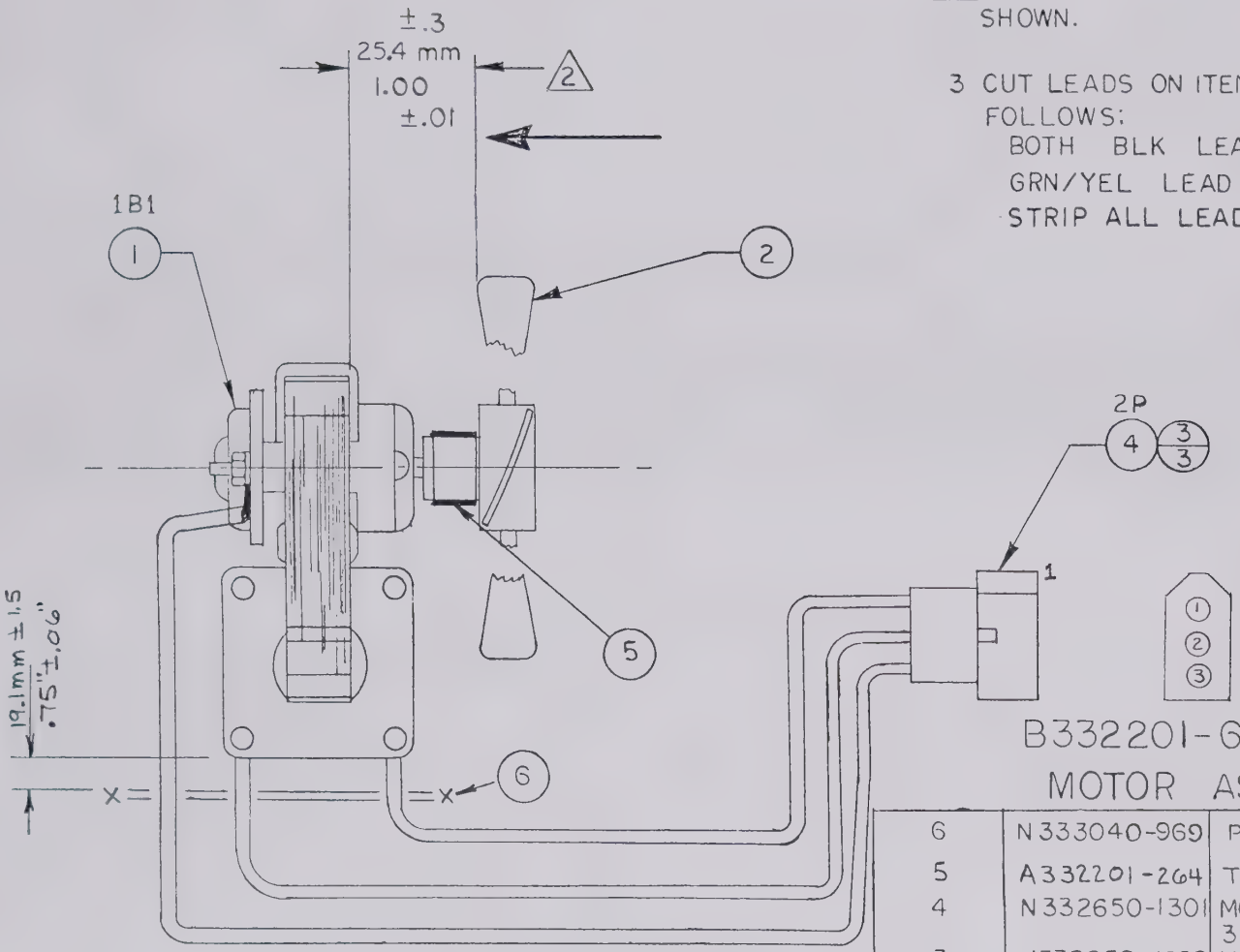
NOTES:

UNLESS OTHERWISE SPECIFIED

1. B&L STANDARDS OF ELECTRICAL WORKMANSHIP SHALL APPLY.

2. WITH END PLAY IN DIRECTION SHOWN.

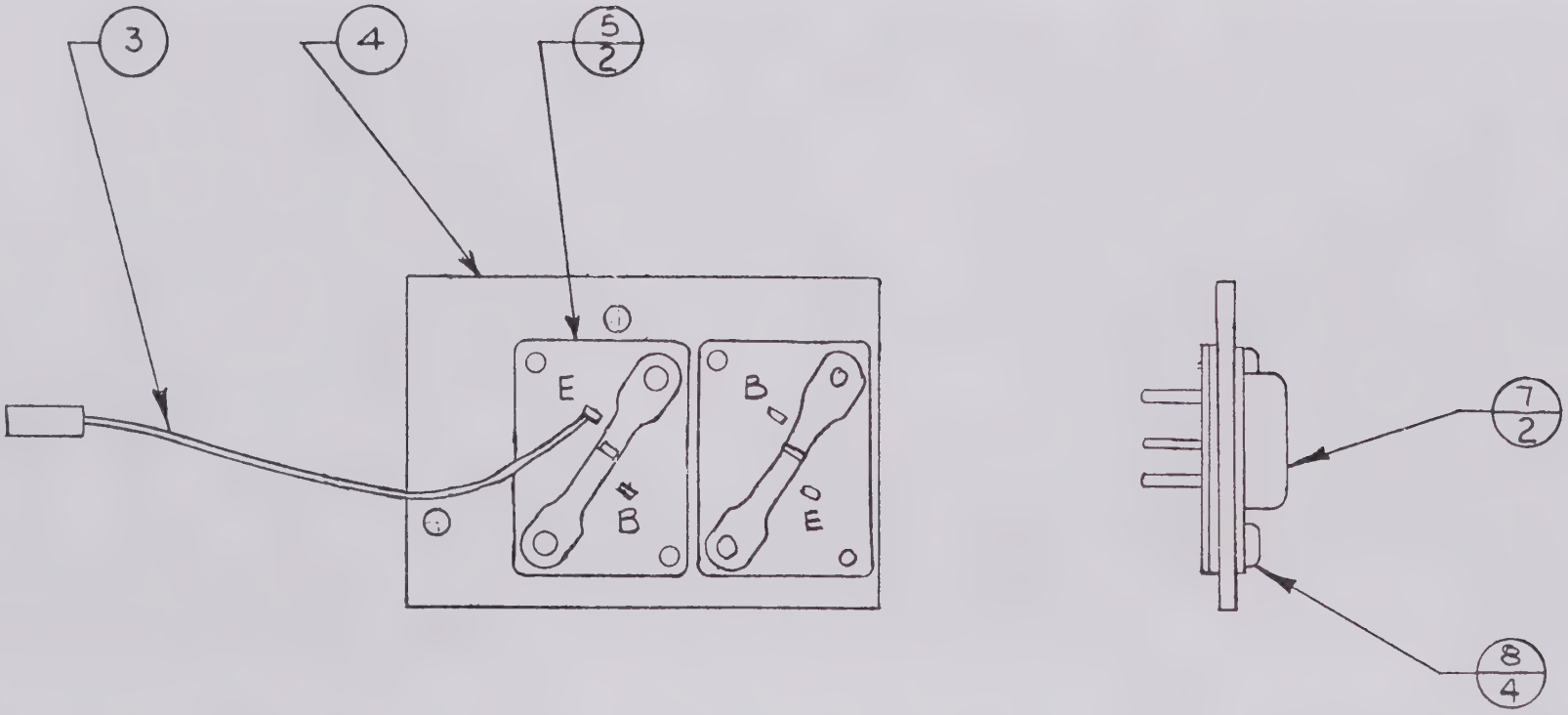
3 CUT LEADS ON ITEM NO. 1 AS FOLLOWS:
BOTH BLK LEADS TO 177.8mm (7")
GRN/YEL LEAD TO 228.6mm (9")
STRIP ALL LEADS 4.8mm (.19") LG.



B332201-681D
MOTOR ASS'Y

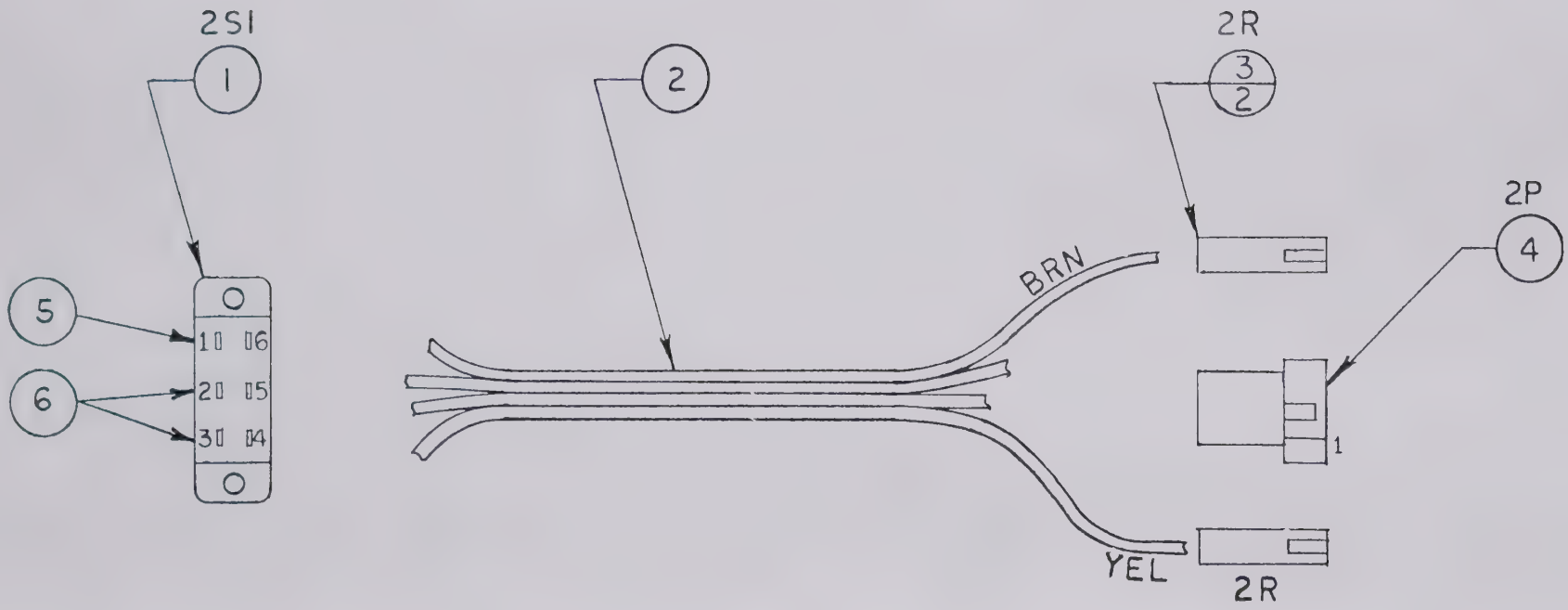
ITEM NO	B&L PART NO	DESCRIPTION
6	N333040-969	PANDUIT SSTIM
5	A332201-264	TINNERMAN
4	N332650-1301	MOLEX PLUG #1396P 3 PIN
3	N332650-1268	MOLEX TERM #1190T
2	B332201-162	FAN BLADE
1	C332201-785	MOTOR

COLOR	FROM	TO	ITEM NO
GRN/YEL	1B1	2P-3	4
BLK	1B1	2P-2	4
BLK	1B1	2P-1	4



HEATSINK ASSY
B332201-724 REV E

ITEM NO	B&L PART NO.	DESCRIPTION
8	S332961-312	SCR #6 SELF TAPPING TYPE B 3/8 LG
7	B332959-710	TRANSISTOR
5	A332201-742	SOCKET
4	B332201-256	SOCKET MOUNT
3	B332201-1631	WIRE ASS'Y.



COLOR	FROM	TO
BRN	2SI- 3	2R-
RED	2SI- 5	2P-2
ORN	2SI- 2	2P-1
YEL	2SI- 4	2R-

SWITCH ASSY (2S1)
B332201-731 REV. C

ITEM NO	B&L PART NO	DESCRIPTION
6	X332201-328	SLEEVE
5	A332201-326	SOLDER GUARD
4	N371988-647	MOLEX PLUG 1545 P-1
3	A332201-728	RECEPTACLE
2	B332201-730	CABLE ASSY
1	A332201-699	SWITCH

NOTES:

UNLESS OTHERWISE SPECIFIED

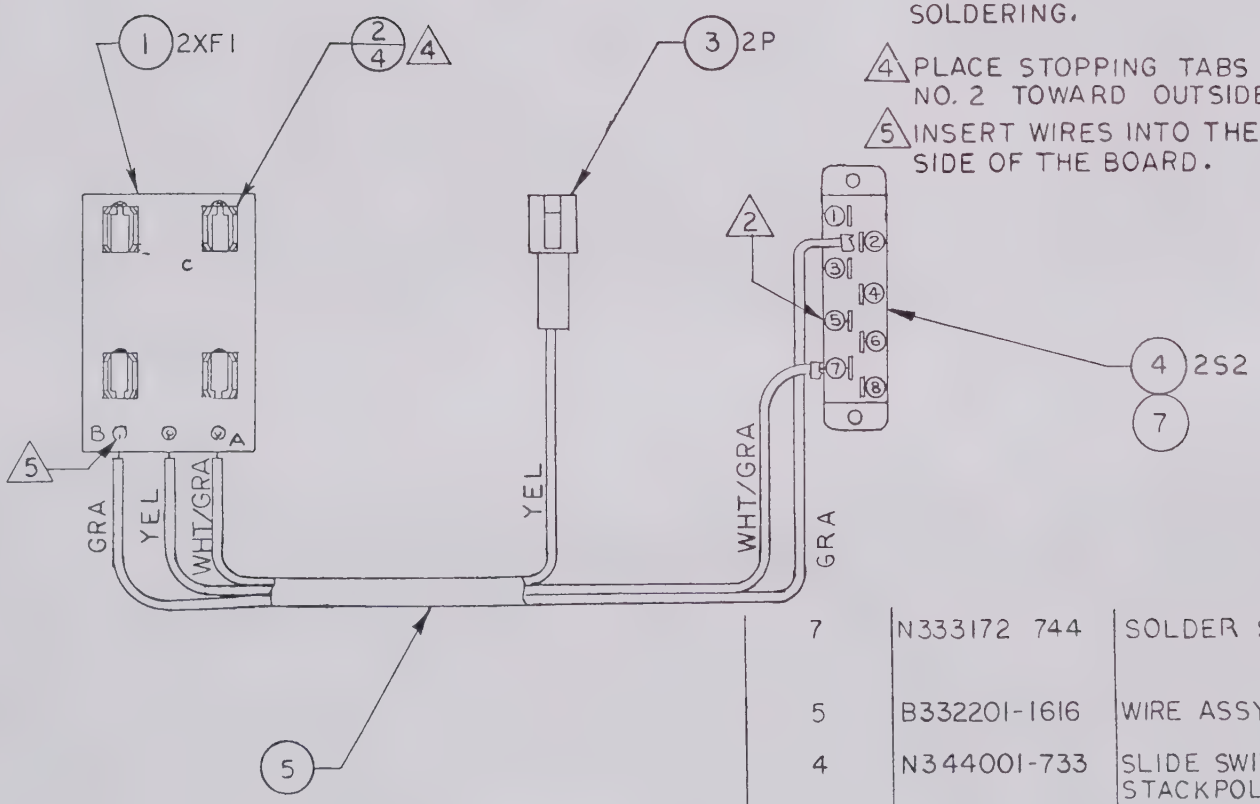
1 B&L STANDARDS OF ELECTRICAL WORKMANSHIP SHALL APPLY

△2 CIRCLED NUMBERS ARE REFERENCE AND DO NOT APPEAR ON PART.

3 PLACE SHRINK TUBING OVER WIRES AT ITEM NO. 4 BEFORE SOLDERING.

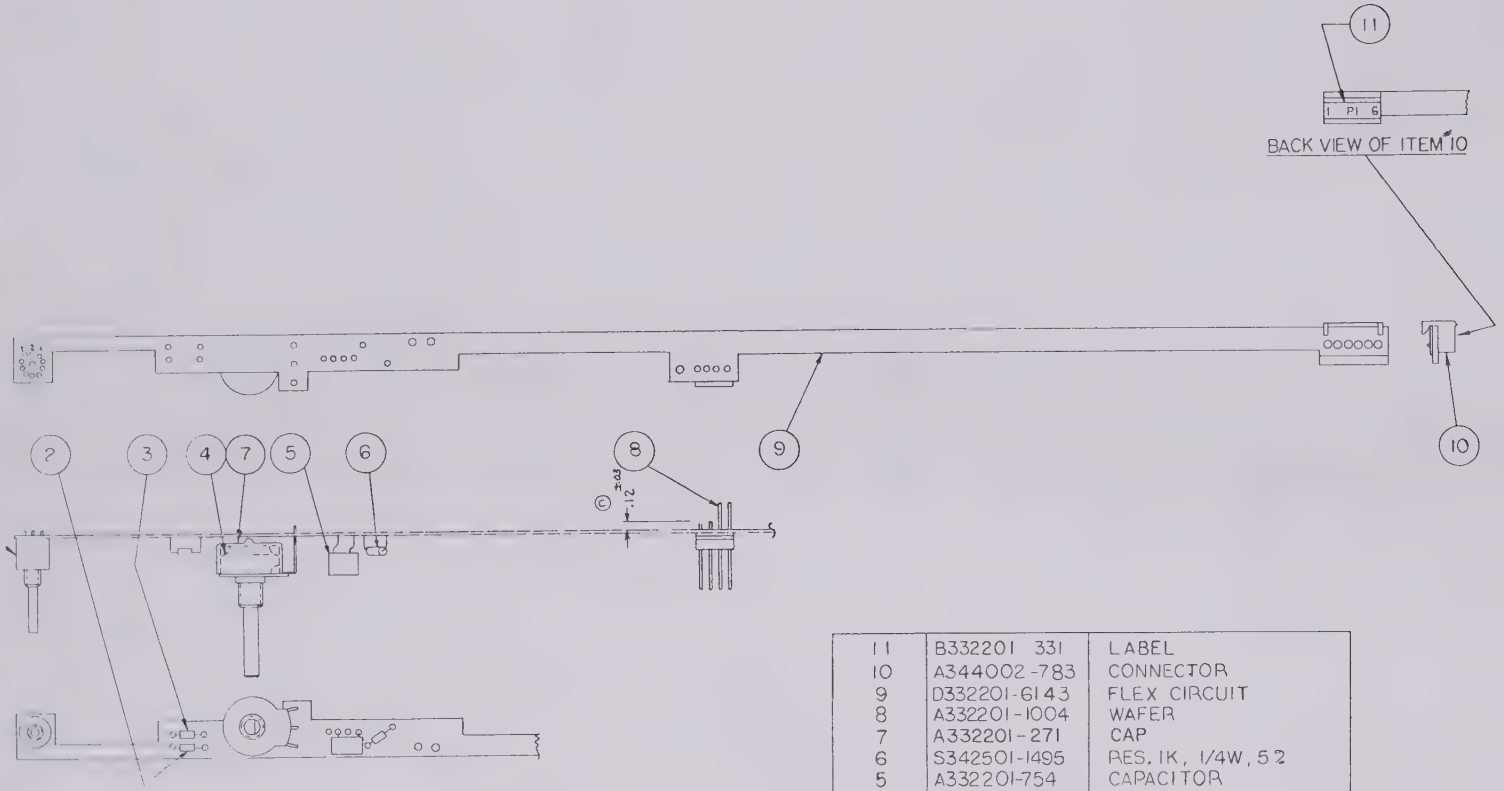
△4 PLACE STOPPING TABS ON ITEM NO. 2 TOWARD OUTSIDE.

△5 INSERT WIRES INTO THE SOLDER SIDE OF THE BOARD.



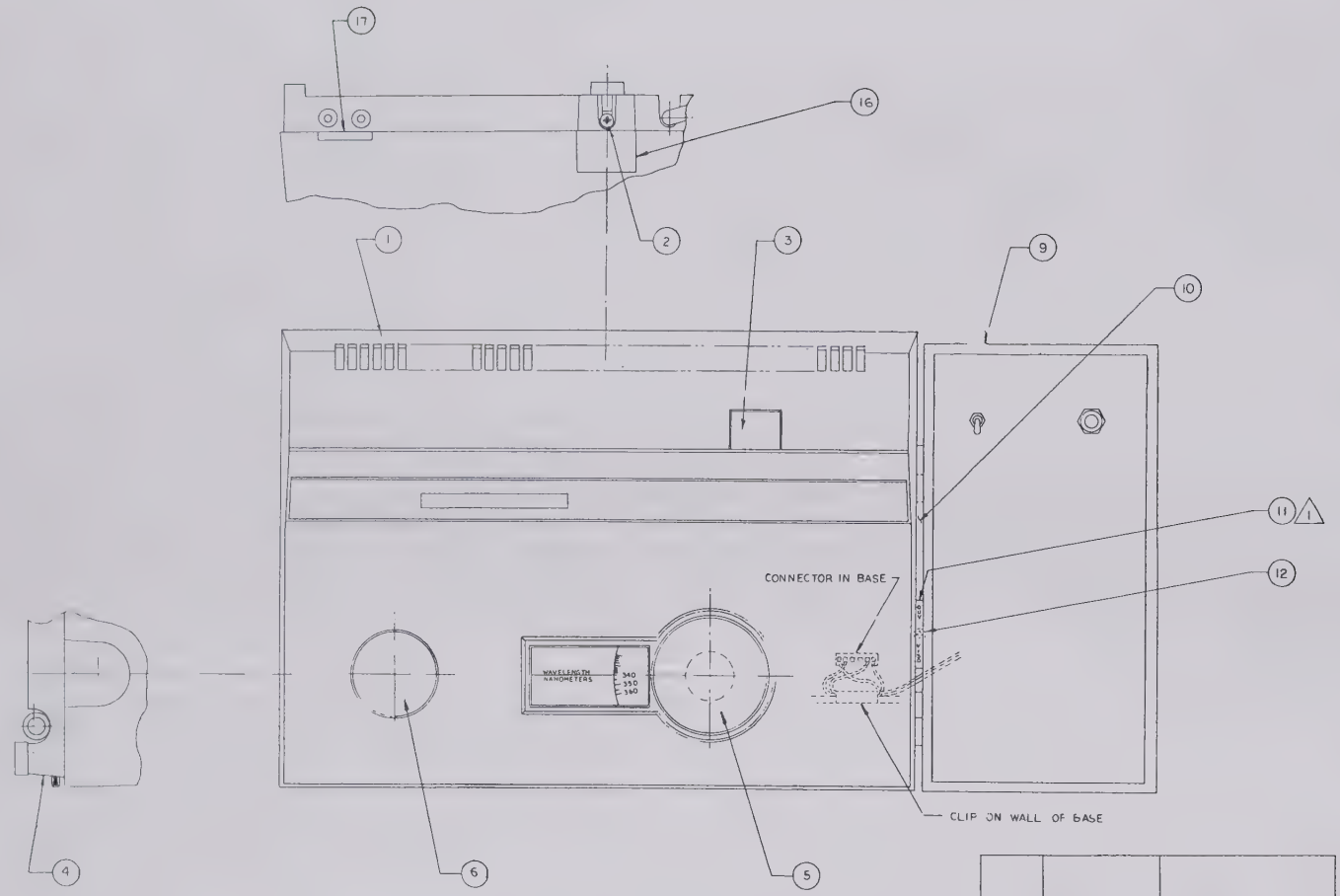
FUSE BOARD ASSY
B332201-604-4 REV E

ITEM NO	B&L PART NO	DESCRIPTION
7	N333172 744	SOLDER SHIELD
5	B332201-1616	WIRE ASSY
4	N344001-733	SLIDE SWITCH DP4POS STACKPOLE SS-18
3	A332201-725	CONNECTOR
2	N343170-661	FUSE CLIP LITTLE-FUSE #102068
1	B332201-604-3	PW BOARD



FLEX CIRCUIT ASSEMBLY
D 332201 - 614 - 4F

ITEM NO.	B&L PART NO.	DESCRIPTION
11	B332201 331	LABEL
10	A344002-783	CONNECTOR
9	D332201-6143	FLEX CIRCUIT
8	A332201-1004	WAFER
7	A332201-271	CAP
6	S342501-1495	RES. 1K, 1/4W, 5%
5	A332201-754	CAPACITOR
4	C332201-738	POTENTIOMETER
3	S371956-644	RES. 39K, 1/4W, 5%
2	S371955-645	RES. 150K, 1/4W, 5%
1	B332201-739	SWITCH



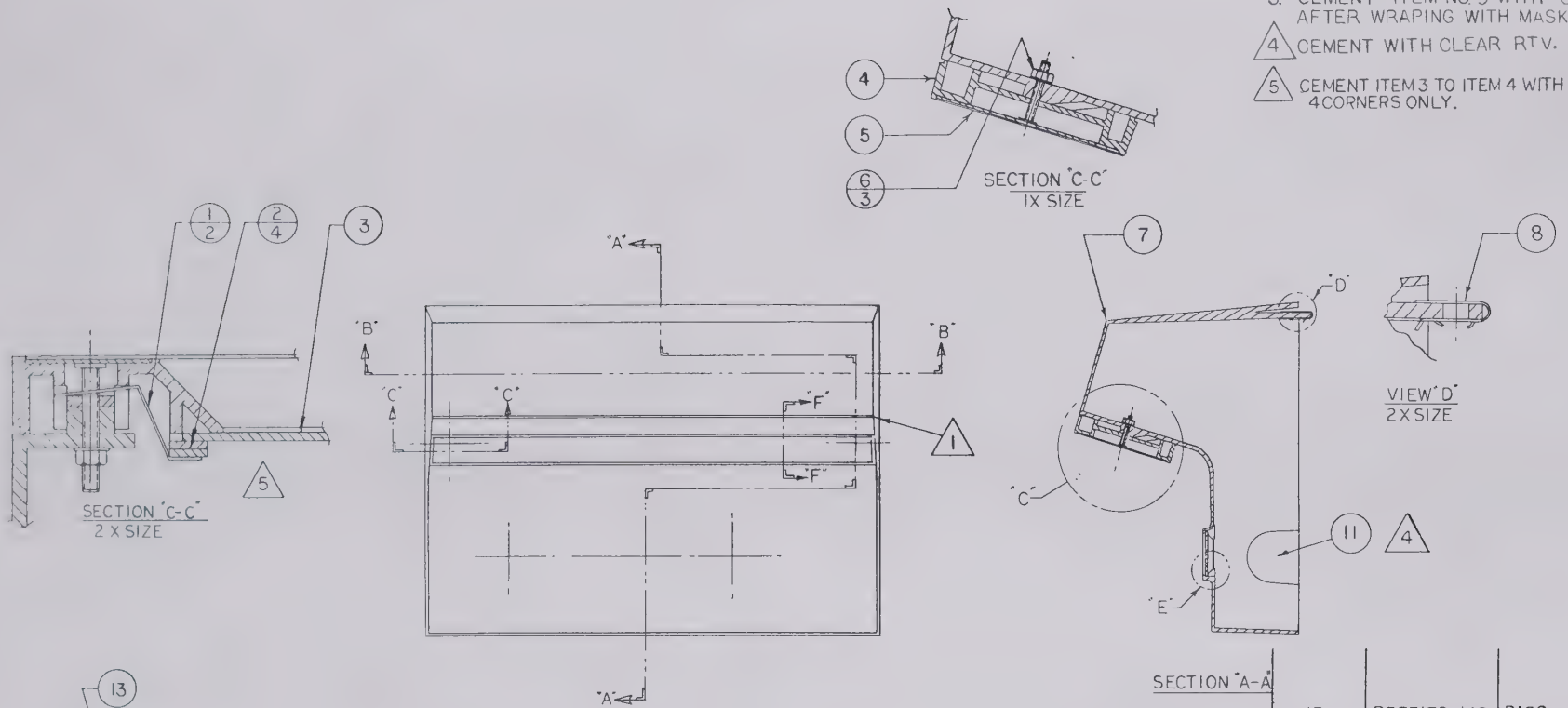
1 ACTIVATE BACK OF ITEM NO.11 WITH PL-59

ITEM NO REF DES	B & L PART NO	DESCRIPTION
17	B332201 - 309	LABEL
16	B332201 - 311	LABEL
15	S332225 - 131	SCR#8-32 X 7/8 FL HD
14	C332225 - 127	ROD
13	S332231 - 102	SCR#8-32 X 7/8 PAN HD.
12	S332225 - 254	SCR#4 X 1/4 TYPE BT
11	B332225 - 240	LABEL
10	C332225 - 222	JUNCTURE COVER
9	D332225 - 2500I	LAMPHOUSE ASSY
6	C332206 - 200	MAIN ASSY
5	B332201 - 159	KNOB ASSY
4	A332225 - 1500I	BASE ASSY
3	B332201 - 241	PLUG
2	S333083 - 167	SCREW#8 X 1/2 TYPE AB
1	D332225 - 170	COVER ASSY

E 332225-200 J
MAIN ASSY

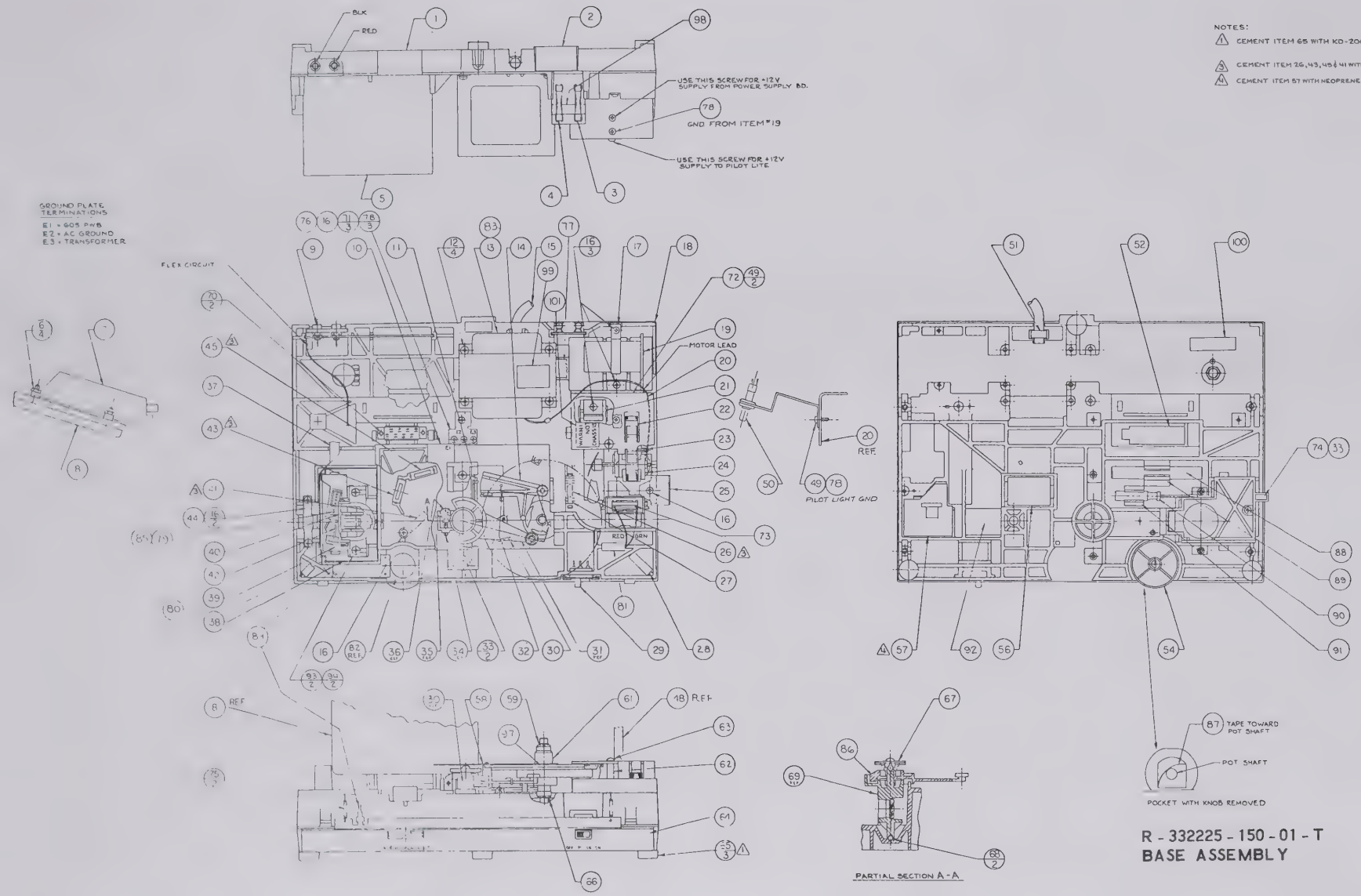
NOTES:
UNLESS OTHERWISE SPECIFIED

1. GAP TO BE UNIFORM WITHIN ±2.5MM (.01") ALONG TOP AND SIDES.
2. CENTER ITEM NO. 11 WITHIN 1.5MM (06")
3. CEMENT ITEM NO. 9 WITH CLEAR RTV AFTER WRAPING WITH MASKING TAPE.
4. CEMENT WITH CLEAR RTV.
5. CEMENT ITEM 3 TO ITEM 4 WITH CLEAR RTV 4 CORNERS ONLY.



ITEM NO	B&L PART NO	DESCRIPTION
13	B333172-148	DISC
11	B332201-184	PLUG
10	B332201-138	WINDOW
9	C332201-142	RETAINER
8	S332201-268	CLIP TINNERMAN C1772F-8A-4
7	E332201-124	COVER
6	S332979-233	6-32 KEPS NUT
5	B332225-286	INSERT
4	D332225-151	BEZEL
3	B332225-113	WINDOW
2	B312515-118	PAD
1	B332225-111	SPRING

D332225 170E
COVER ASSY


NOTES:
1 CEMENT ITEM 65 WITH KD-200
3 CEMENT ITEM 26,43,45 & 41 WITH KD-BC
4 CEMENT ITEM 57 WITH NEOPRENE F1
GROUND PLATE TERMINATIONS
E1 = 605 PWB
E2 = AC GROUND
E3 = TRANSFORMER
BLK
RED
USE THIS SCREW FOR +12V SUPPLY FROM POWER SUPPLY BD.
GND FROM ITEM #19
USE THIS SCREW FOR +12V SUPPLY TO PILOT LITE
FLEX CIRCUIT
MOTOR LEAD
PILOT LIGHT GND
REF.
TAPE TOWARD POT SHAFT
POT SHAFT
POCKET WITH KNOB REMOVED
PARTIAL SECTION A-A
R - 332225 - 150 - 01 - T
BASE ASSEMBLY

Date Rev. Letter	List of Parts for 332225-150-01 BASE ASS'Y	BAUSCH & LOMB	332225-150-02

Item No. Ref. Des.	B & L Part No.	Description	Item No. Ref. Des.	B & L Part No.	Description
1	B332225-156	PLATE	18	R332201-105	BASE
2	B332225-114	ELECTRICAL PLATE	19	C332225-602-401	P.W. BD. ASS'Y
3	S332225-277	FUSE, 2 1/2A SB 125V	20	C332201-106	HEAT SINK
4	S333083-737	FUSE, 1 1/4A SB 250V	21	B332201-223	SYNC. DET. ASS'Y
5	C332201-605-401	P.W. BD. ASS'Y	22	B332201-232	MOTOR SHIELD
6	S332979-233	6 - 32T KEPS NUT	23	S332201-244	9/64 DIA. DOWEL PIN
7	D332225-152	METER MOUNT	24	B332201-681	MOTOR ASS'Y
8	C332225-154-01	METER	25	C332225-104	LENS B ASS'Y
9	B332201-676	OUTPUT JACK ASS'Y	26	B332201-028	COND. LENS
10	D332201-119	MONO COVER	27	B332201-224	SPRING
11	B332225-133	ENTRANCE SLIT	28	A332201-270	PAD
12	S333172-118	#8 TYPE BT X 1/2 LG.	29	B332201-731	SWITCH ASS'Y
13	C332225-642	TRANSFORMER ASS'Y	30	C332201-301	SPRING, TORSION
14	B332201-146	FILTER MOUNT ASS'Y	31	D332201-102	FOLLOWER
15	B332201-677	POWER CORD ASS'Y	32	B332201-254	SPRING
16	S333172-119	#6 TYPE BE X 1/2 LG.	33	S342501-473	8 - 32T X 3/8 LG.
17	B332225-119	CLAMP	34	S332201-246	6 - 32T X 3/8 LG.

Date Rev. Letter	List of Parts for 332225-150-01 BASE ASS'Y	BAUSCH & LOMB	332225-150-03

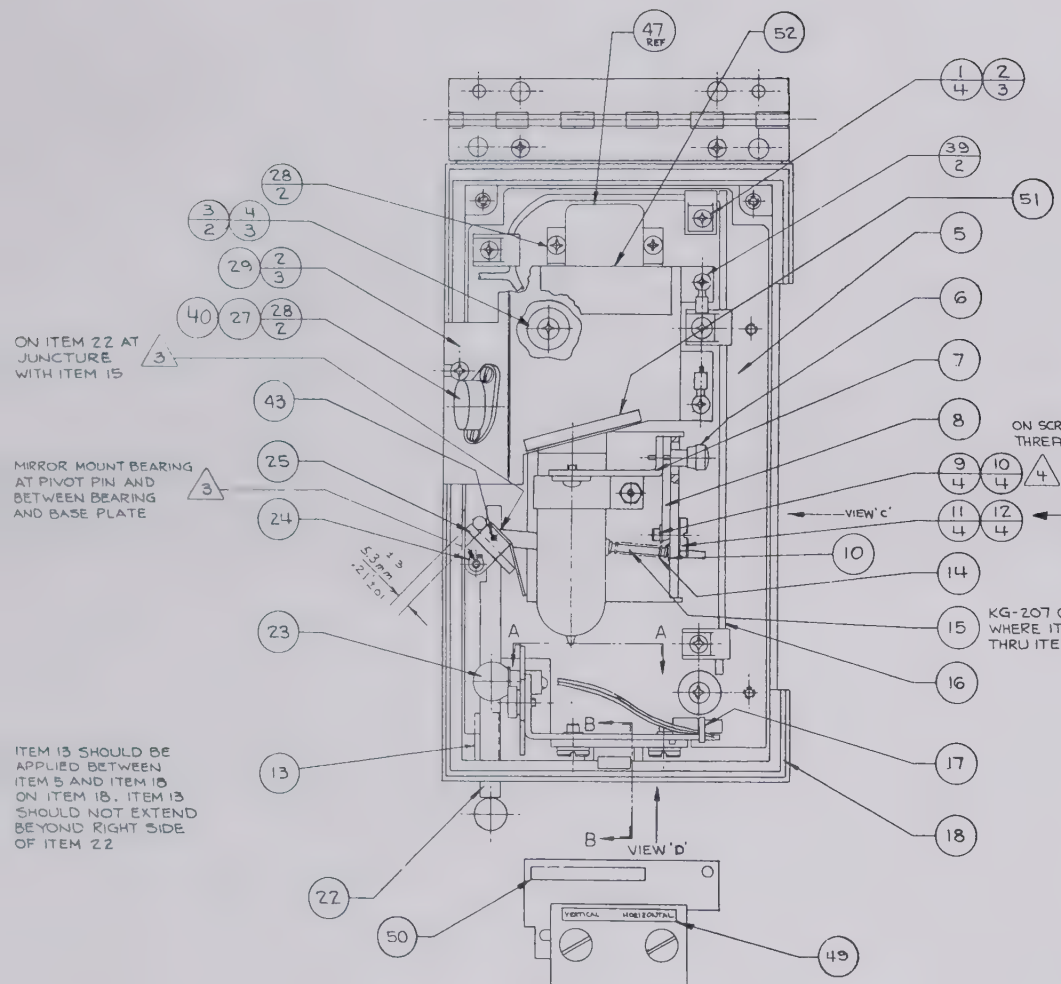
Item No. Ref. Des.	B & L Part No.	Description	Item No. Ref. Des.	B & L Part No.	Description
35	A332201-189	SPRING	57	C332201-201	PLATE
36	S332201-285	3.64 DIA. ROLL PIN	58	B332201-283	INDEX PLATE ASS'Y
37	D332225-6054	FLEX CIRCUIT ASS'Y	59	N332959-136	TRUARC
38	C332201-203	SHROUD	61	B332225-121	CAM ASS'Y
39	B332201-204	SENSOR COVER	62	A332201-207	SPACER
40	B332225-110	EXIT SLIT ASS'Y	63	S332201-245	8 - 32T X 1 3/4 LG.
41	B332225-106	MIRROR MOUNT ASS'Y	64	B332225-117	FRONT PLATE
42	C332223-603-601	SENSOR ASS'Y	65	A332201-209	FOOT
43	B332225-101	MIRROR A ASS'T	66	A332201-312	WASHER
44	C332201-257	SPRING	67	C332201-329	STRAP ASS'Y
45	B332225-102	MIRROR B ASS'Y	68	S332201-165	.187 DIA. BALL
49	S332201-250	#6 TYPE AB X 3/8 LG.	69	B332201-148	GRATIN ASS'Y
50	B332225-162	LAMP ASS'Y	70	S343022-270	#4 TYPE F X 3/8 LG.
51	A332201-289	TY-RAP	71	S344001-305	6 -32T X 1/4 LG.
52	B332201-219	GUARD ASS'Y	72	B332225-644	HEAT SINK ASS'Y
54	N332201-292	KNOB ASS'Y	73	C332225-606-3	CONNECTOR BOARD
56	B332201-180	COVER	74	B332201-273	BASE COVER ASS'Y

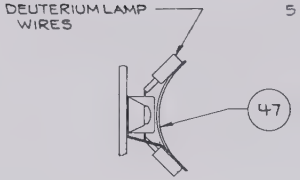
Date Rev. Letter	List of Parts for 332225-150-01 BASE ASS'Y	BAUSCH & LOMB	332225-150-04

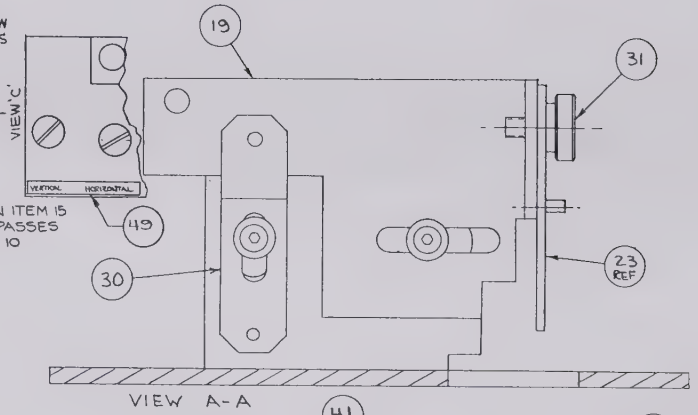
Item No. Ref. Des.	B & L Part No.	Description	Item No. Ref. Des.	B & L Part No.	Description
75	A332201-260	SPRING	92	B332201-315	PLATE
76	B332225-157	GROUND PLATE	93	S338640-190	WASHER #10
77	B332201-683-01	FLEX. CIRCUIT ASS'Y	94	S334558-401	8 - 32T X 1/2 LG. SCR.
78	S332501-1181	#6 EXT. TOOTH LOCK WASHER	97	B332201-267	WASHER
79	S332201-249	#4 TYPE F X 1/2 LG.	98	B332225-281	LABEL
80	A332201-269	PAD	99	B333083-163	LABEL
81	S332201-279	TINNERMAN	100	B332201-310	LABEL
82	A332201-271	CAP	101	B332201-135	LABEL
83	B332201-286	INSULATOR			
84	B332201-1625	WIRE ASS'Y			
85	B332201-293	STANDOFF			
86	B332225-15801	GRATING ASS'Y			
87	B332201-300	SPRING ASS'Y			
88	A332201-316	OCCLUDER			
89	A332201-320	CLIP			
90	A332201-317	SCREW DRIVER			
91	A332201-319	CLIP			

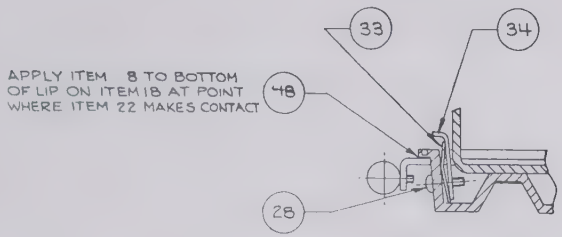
NOTES:
UNLESS OTHERWISE SPECIFIED

2. APPLY KG-207 BETWEEN LAMP ADJ. PLATES.
3. APPLY KG-284
4. APPLY KG-208
5. INSERT ITEM 53 INTO HOLE IN BOTTOM OF ITEM 18.

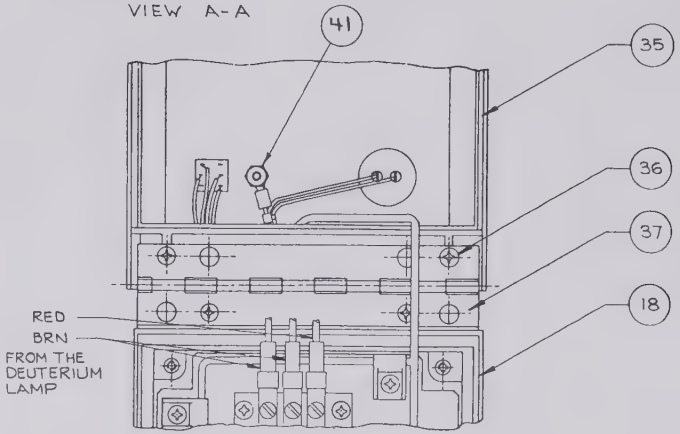








SECTION B-B



PLAN VIEW OF BASE & COVER

LAMPHOUSE ASSEMBLY
332225-25001 REV. L

Date 2-12-75 ECO Rev. Letter K 37736	List of Parts for 332225-25001	BAUSCH & LOMB	332225-25002

Item No. Ref. Des.	B & L Part No.	Description
1	A332225-657	CABLE CLAMP
2	S344001-102	SCR, # 8X3/8 REC. PAN HD. TYPE B
3	S332225-224	WASHER, .625 O.D. X171 I.D. X .062 THK.
4	S342501-473	SCR, # 8.32 X 3/8 REC. PAN HD.
5	B332225-282	ASS'Y PLATE
6	A332225-275	SCREW ASS'Y
7	B332225-231	ASS'Y LAMPMOUNT
8	B332225-232	ASS'Y., ADJUSTMENT PLATE
9	S332650-1678	SCR. #4-40 X 1/4 SOC. HD. CAP.
10	S332225-226	WASHER, .375 O.D. X .140 I.D. X .045 THK.
11	B33225-220	ECCENTRIC
12	A338636-202	SPRING WASHER
13	X332225-253	FOAM
14	B332225-213	SPRING
17	N333040-969	STA-STRAP # SST 1M
18	E332225-201	BASE
19	B332225-256	MOUNT ASS'Y
22	B332225-280	CONTROL ROD ASS'Y
23	B333307-6024	ASS'Y., LAMP BOARD
24	S343120-232	GRIPPING, TRUARC #5555-12
25	B332225-237	SHUTTER ASSEMBLY
27	N333060-700	TRANSISTOR 2N5068
28	S344001-195	SCR, # 6-32 X 1/2 REC. PAN HD.
29	D332225-205	HAT SINK

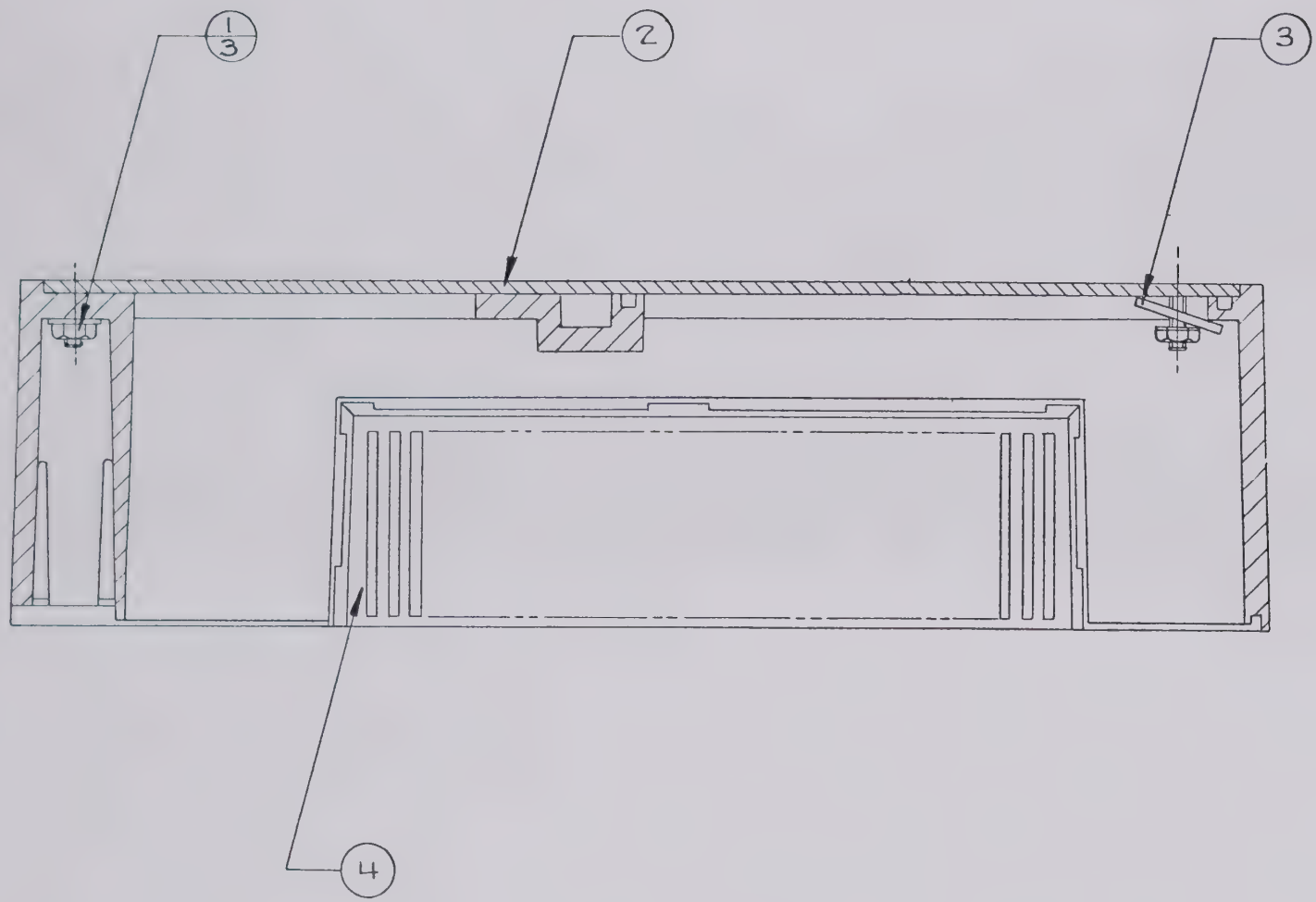
Date 2-12-75 ECO
Rev. Letter L 51538

List of Parts for 332225-25001

BAUSCH & LOMB

332225-25003

Item No. Ref. Des.	B & L Part No.	Description
30	B332225-255	LINK ASSEMBLY
31	A332225-257	THUMB SCREW
32		
33	B332225-209	LATCH SPRING
34	B332225-208	LATCH
35	D332225-249	ASSEMBLY COVER
36	S333172-119	SCR, # 6X 1.2 REC. PAN HD. TYPE BT
37	C332225-203	HINGE
39	S343001-194	# 8 EXT. TOOTH WASHER
40	N332959-761	INSULATOR
41	S332979-233	6 - 32 T KEPS NUT
43	B332225-029	MIRROR
47	B332225-278	SHIELD
48	X332225-284	TEFLON TAPE
49	B332225-272	LABEL
50	B332225-273	LABEL
51	B332225-274	LABEL
52	B332225-271	LABEL
53	A332230-126	CAP PLUG



ITEM NO	B&L PART NO	DESCRIPTION
4	C332201-279	COVER & DOOR ASS'Y
3	S332225-234	WASHER, .750 O.D. x .250 I.D. x .06 THK.
2	C332225-248	TOP PLATE
1	S332979-233	NUT #6-32 KEPS

COVER ASSEMBLY
332225-249 REV. A

6-59

NOTES:

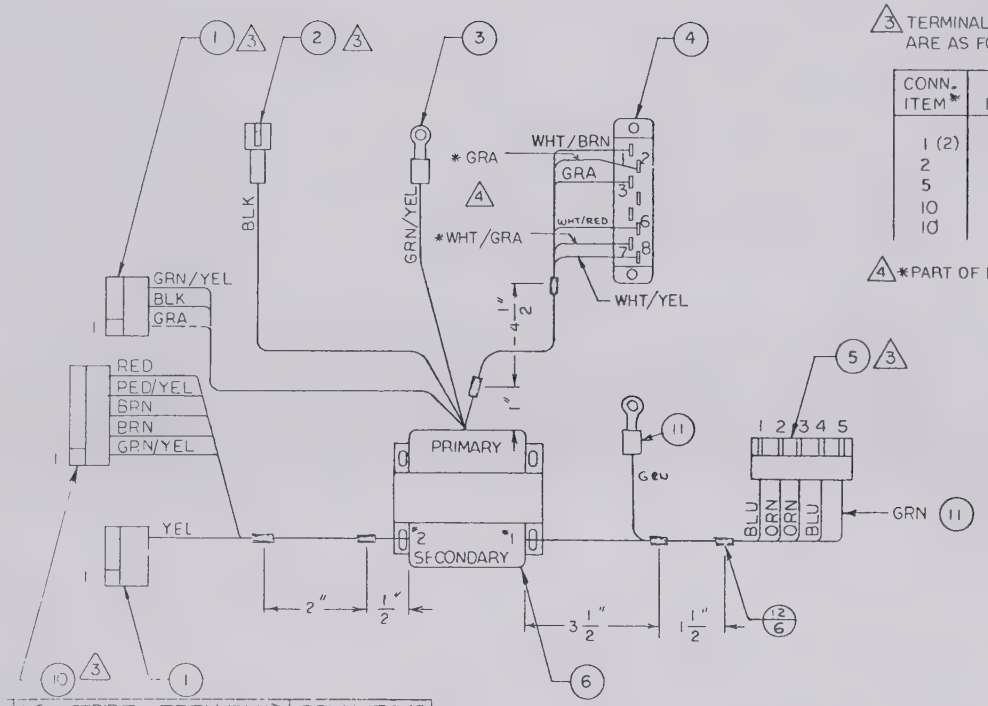
UNLESS OTHERWISE SPECIFIED

1. DIMENSIONING PER CURRENT ANSI STANDARD Y14.5
2. B+L "STANDARDS OF ELECTRICAL WORKMANSHIP" SHALL APPLY.

△3 TERMINALS USED IN CONNECTORS ARE AS FOLLOWS:

CONN. ITEM *	TERM. ITEM *	UNIT
1 (2)	7	3 (6)
2	8	1
5	9	4
10	7	4
10	8	1 PIN *1

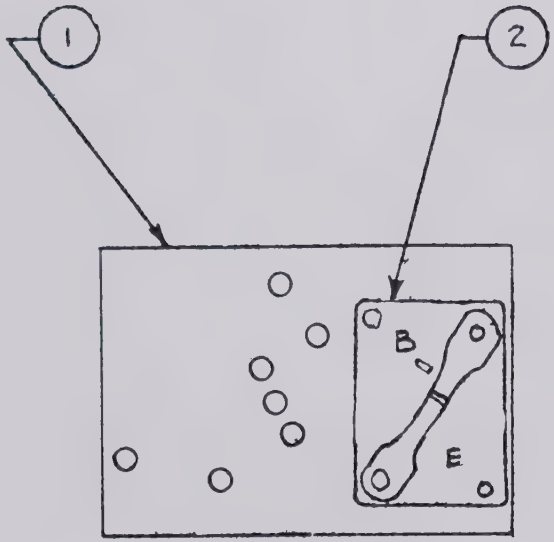
△4 *PART OF ITEM *4

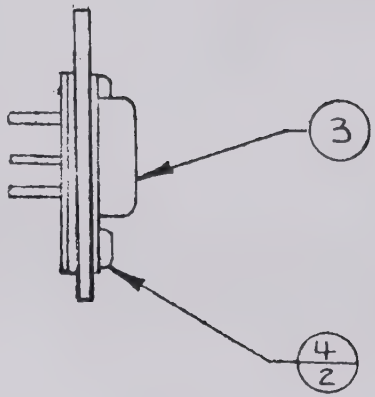


COLOR	LG.	STRIP TN.	TERM. ITEM *	CONN. ITEM *
GRN/YEL	4"	1/4	*7	*1
BLK	4"	1/4	*7	*1
GRA	4"	1/4	*7	*1
BLK	4"	1/4	*8	*2
GRN/YEL	4"	1/4	*3	—
WHT/BRN	7"	1/4(T)	—	—
GRA	7"	1/4(T)	—	—
WHT/RED	7"	1/4(T)	—	—
WHT/YEL	7"	1/4(T)	—	—
BLU	6"	1/4	*9	*5
BLU	6"	1/4	*9	*5
ORN	6"	1/4	*9	*5
ORN	6"	1/4	*9	*5
YEL	5"	1/4	*7	*1
RED	4"	1/4	*7	*10
RED/YEL	4"	1/4	*7	*10
BRN	4"	1/4	*7	*10
BRN	4"	1/4	*7	*10
GRN/YEL	4"	1/4	*8	*10

TRANSFORMER ASS'Y
C332225-642 D

ITEM NO.	B+L PART NO.	DESCRIPTION
12	N333040-969	PANDUIT SSTIM
11	B332201-1628	WIRE ASSY
10	N333083-741	RECEPTACLE MOLEX *1653R-1
9	A332201-721	TERM
8	S370302-765	TERM MOLEX 1380
7	S333023-658	TERM MOLEX 1381
6	C332225-641	TRANSFORMER
5	A332201-729	CONNECTOR
4	B332201-604-4	FUSE BD. ASS'Y
3	N532364-196	TERM ETC AA-232-06X-T
2	A332201-725	CONNECTOR
1	N332650-1302	CONN MOLEX 1396R-1





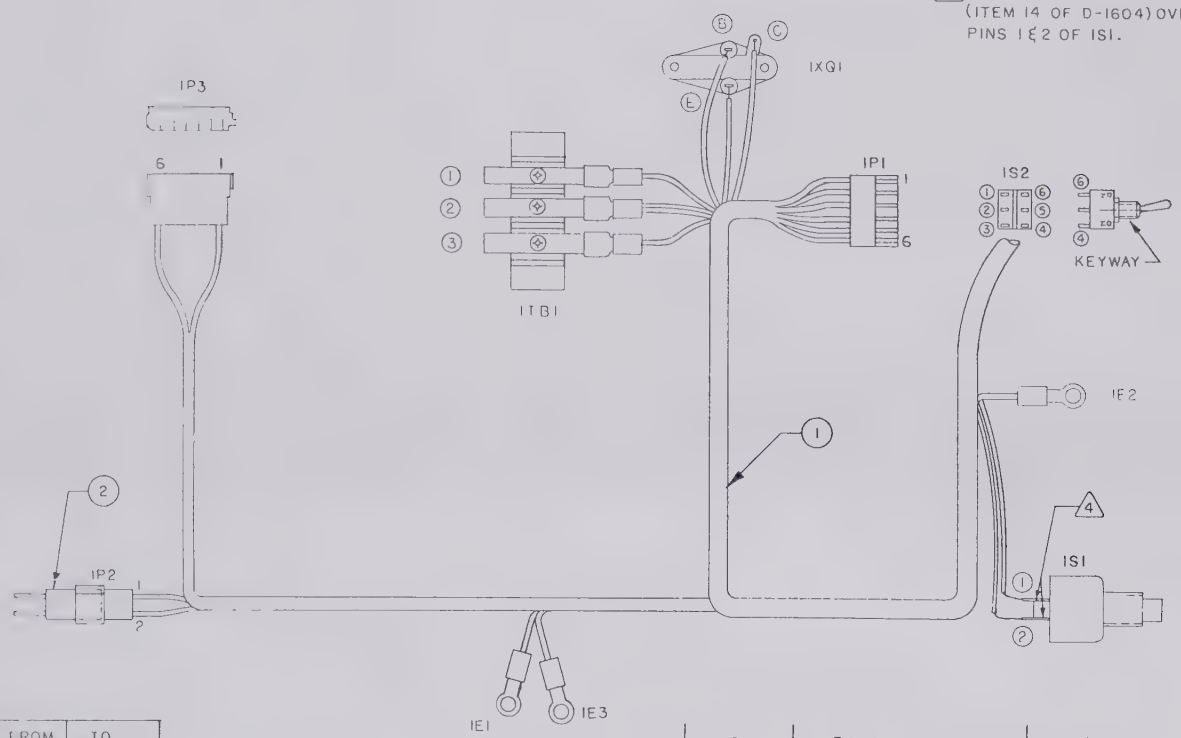
HEATSINK ASSY
B332225-644 REV C

ITEM NO	B&L PART NO.	DESCRIPTION
4	S332961-312	SCR #6 SELF TAPPING TYPE B 3/8 LG
3	B332959-710	TRANSISTOR
2	A332201-742	SOCKET
1	B332201-256	SOCKET MOUNT

NOTES:

UNLESS OTHERWISE SPECIFIED

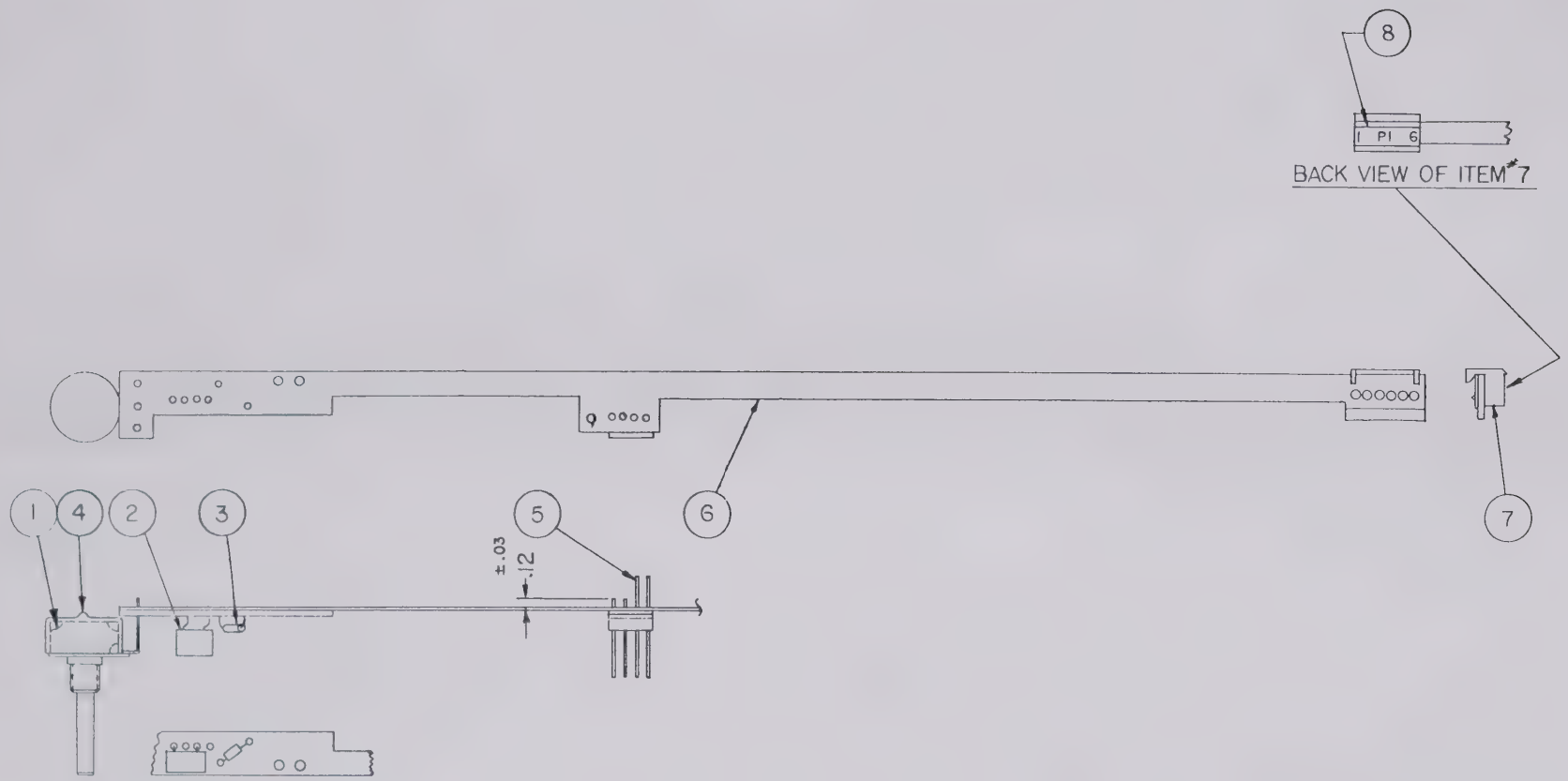
1. DIMENSIONING PER CURRENT ANSI STANDARD Y14.5
2. B&L "STANDARDS OF ELECTRICAL WORKMANSHIP" SHALL APPLY.
3. CIRCLED NOS & LETTERS DO NOT APPEAR ON PARTS & ARE FOR REF ONLY.
4. INSTALL SHRINK TUBING (ITEM 14 OF D-1604) OVER PINS 1 & 2 OF IS1.



CLR	FROM	TO
[illegible]	TB1 1	P1 1
[illegible]	IS1 [illegible]	P1 - 2
VIO	[illegible]	P1 - 3
BLK	[illegible]	P1 4
[illegible]	[illegible]	P1 5
[illegible]	[illegible]	P1 6
[illegible]	[illegible]	TB1 3
BLK	[illegible]	- 4
[illegible]	[illegible] 5	XQ1 [illegible]
[illegible]	[illegible] 1	IS [illegible] 1
[illegible]	[illegible]	IP3 1
[illegible]	[illegible] 2	IP3 6

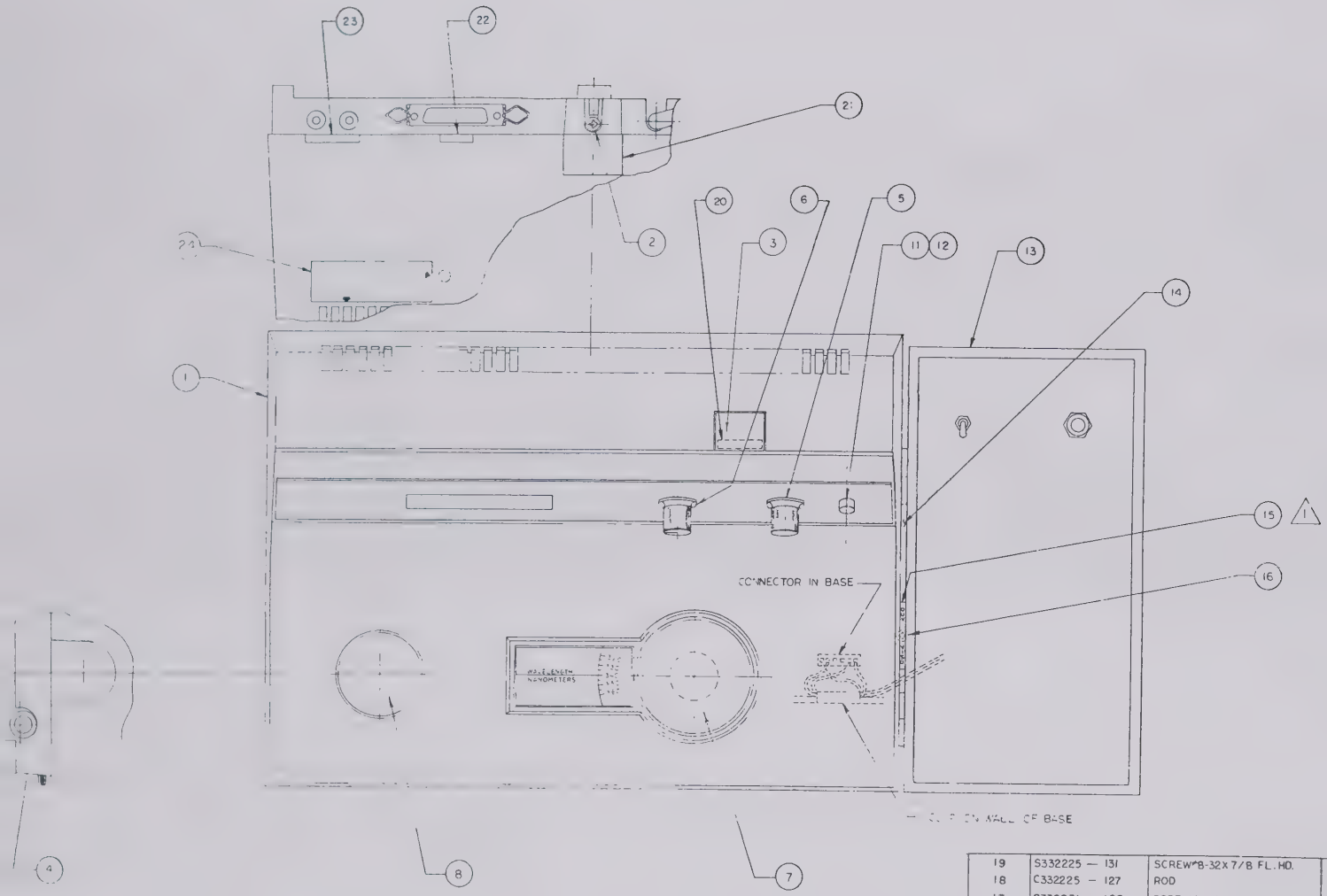
CABLE ASSY
C332225-1606 B

ITEM NO	B&L PART NO	DESCRIPTION
2	B332225-679	ASS'Y, RECEPT.
1	D332225-1605	ASS'Y, WIRE HARN.
IXQ1	N333172-745	EBY 9866-15-5
IP3	A332225-656	CONNECTOR
IP2	A332225-659	PLUG
IP1	A332225-660	CONNECTOR
ITB1	A332225-661	TERMINAL BD.
IS2	A332225-667	SWITCH
IS1	A332225-655	SWITCH



FLEX CIRCUIT ASSY
C332225-605-4 D

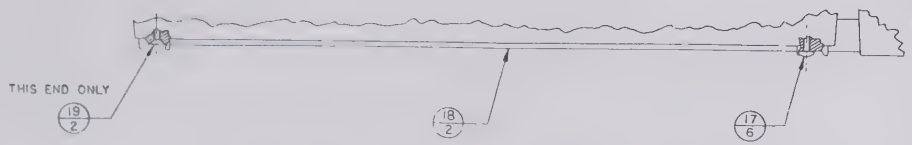
ITEM NO.	B&L PART NO.	DESCRIPTION
8	B332201-331	LABEL
7	A344002-783	CONNECTOR
6	C332225-605-3	FLEX CIRCUIT
5	A332201-1004	WAFER
4	A332201-271	CAP
3	S371951-672	RES. 120Ω, 1/4 W, 5%
2	A332201-754	CAPACITOR
1	C332225-645	POTENTIOMETER



NOTES:
UNLESS OTHERWISE SPECIFIED

1. DIMENSIONING PER CURRENT ANSI STANDARD Y14.5

1 ACTIVATE BACK OF ITEM NO 15 WITH PL-59

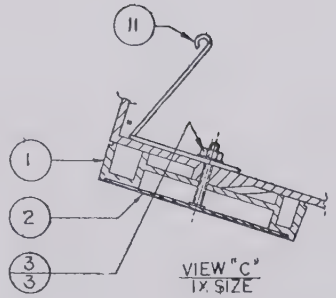


ITEM NO REF. DES	B&L PART NO	DESCRIPTION	ITEM NO REF DES	B&L PART NO	DESCRIPTION
19	S332225 – 131	SCREW #8-32 X 7/8 FL. HD.			
18	C332225 – 127	ROD			
17	S332231 – 102	SCREW #8-32 X 7/8 PAN HD.			
16	S332225 – 254	SCREW #4 X 1/4 TYPE BT			
15	B332225 – 240	LABEL			
14	C332225 – 222	JUNCTURE COVER			
13	D332225 – 25001	LAMPHOUSE ASSY			
12	A332201 – 314	KNOB			
11	B332201 – 278	EXTENSION			
8	C 332206 – 200	MAIN ASSY			
7	B 332201 – 159	KNOB ASSY			
6	B 332201 – 212	KNOB ASSY			
5	B 332201 – 213	KNOB ASSY	24	B332201-346	LABEL
4	B 332226 – 15001	BASE ASSY	23	B332201-309	LABEL
3	B 332201 – 241	PLUG	22	B332201-308	LABEL
2	S 333083 – 167	SCREW 8 X 1/2 TYPE AB	21	B332201-311	LABEL
1	D 332226 – 170	COVER ASSY	20	B332201-307	LABEL

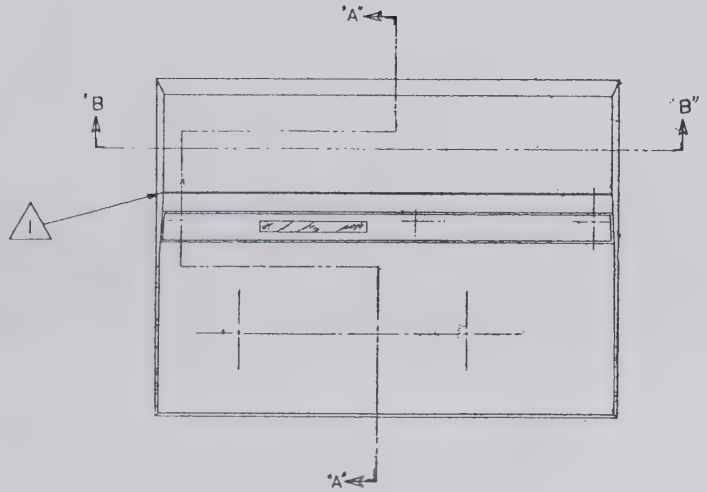
E 332226-200 K
MAIN ASSY

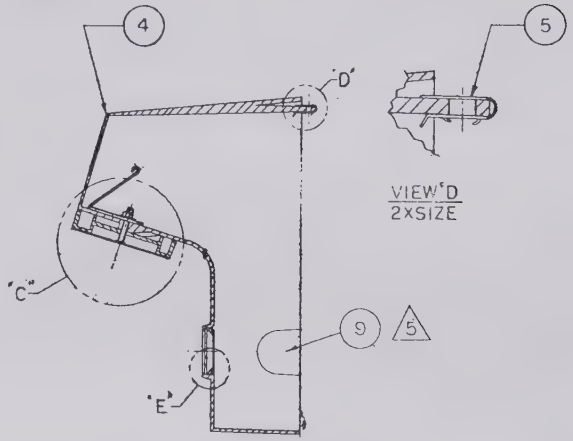
NOTES:
UNLESS OTHERWISE SPECIFIED

1. GAP TO BE UNIFORM WITHIN ±.25mm (.010") ALONG TOP AND SIDES.
3. CEMENT ITEM #6 WITH CLEAR RTV AFTER WRAPING WITH MASKING TAPE.
4. CEMENT WITH NEOPRENE F-1.
5. CEMENT WITH CLEAR RTV



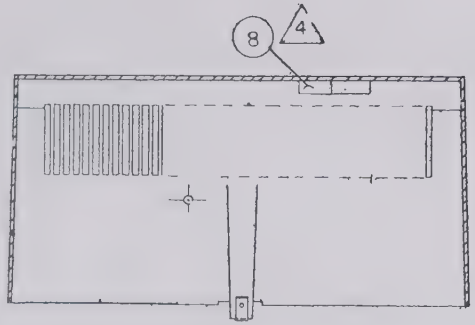
VIEW "C"
1X SIZE



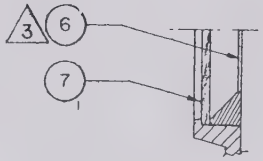


VIEW "D"
2X SIZE

SECTION "A-A"



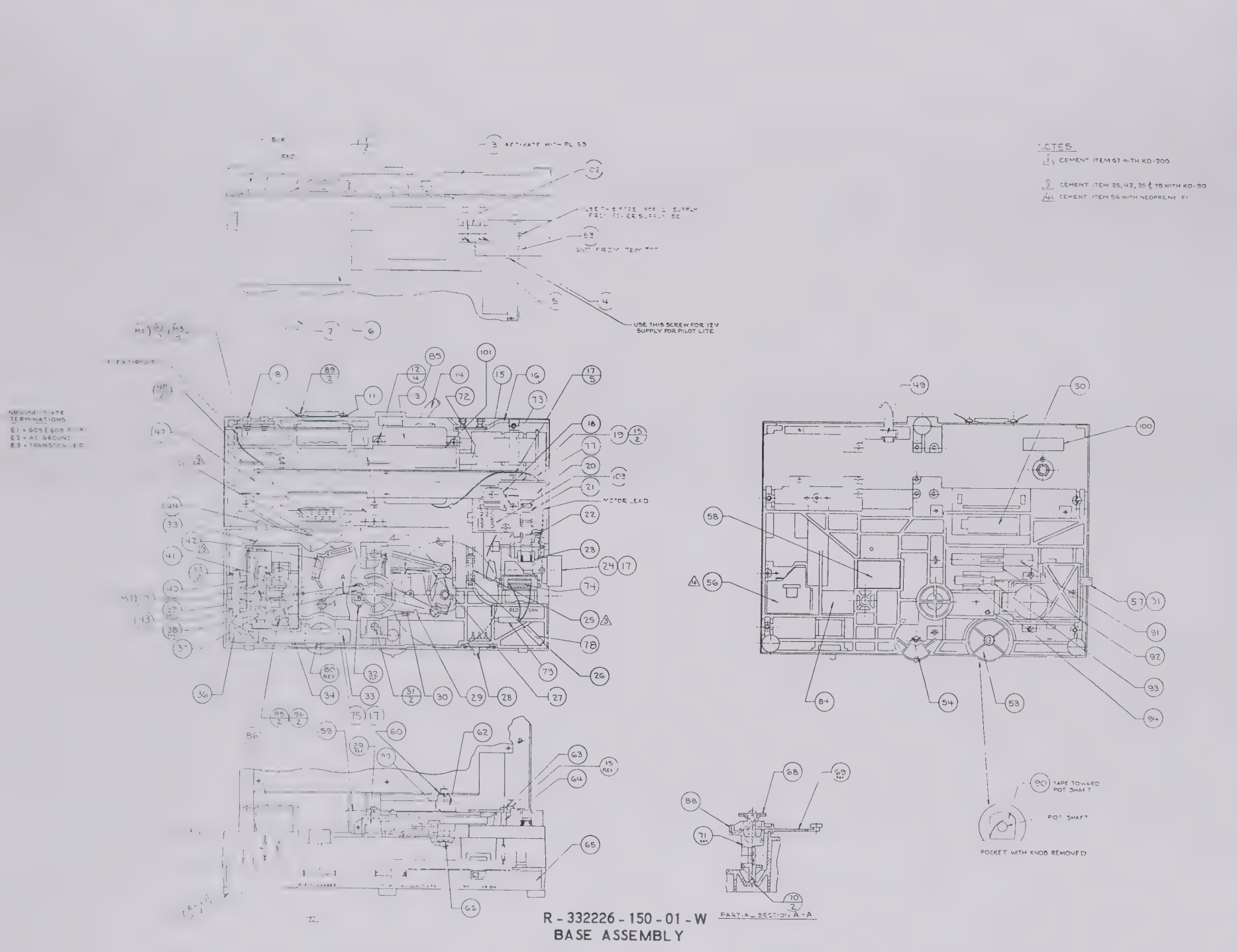
SECTION "B-B"



VIEW "E"
2X SIZE

ITEM NO. REF. DES.	B+L PART NUMBER	DESCRIPTION
11	C332201-325	GROUND STRAP
9	B332201-184	PLUG
8	B332201-266	PAD
7	B332201-138	WINDOW
6	C332201-142	RETAINER
5	S332201-268	CLIP, TINNERMAN *C17721-8A-4
4	E332201-124	COVER
3	S332979-233	6-32 KEPS NUT
2	B332201-240	INSERT ASSY
1	C332201-235	BEZEL

D332226-170 A
COVER ASSY


NOTES
CEMENT ITEM 97 WITH KD-200
CEMENT ITEM 25, 42, 35 & 78 WITH KD-80
CEMENT ITEM 56 WITH NEOPRENE FI
ACTIVATE WITH PL 33
USE THIS SCREW FOR 12 V SUPPLY FOR PILOT LITE
MOTOR LEAD
RED
GRN
TAPE TOWARD POT SHAFT
POT SHAFT
POCKET WITH KNOB REMOVED
PARTIAL SECTION A-A

R - 332226 - 150 - 01 - W
BASE ASSEMBLY

Date Rev. Letter	List of Parts for 332226-15001 BASE ASS'Y	BAUSCH & LOMB	332226-15002

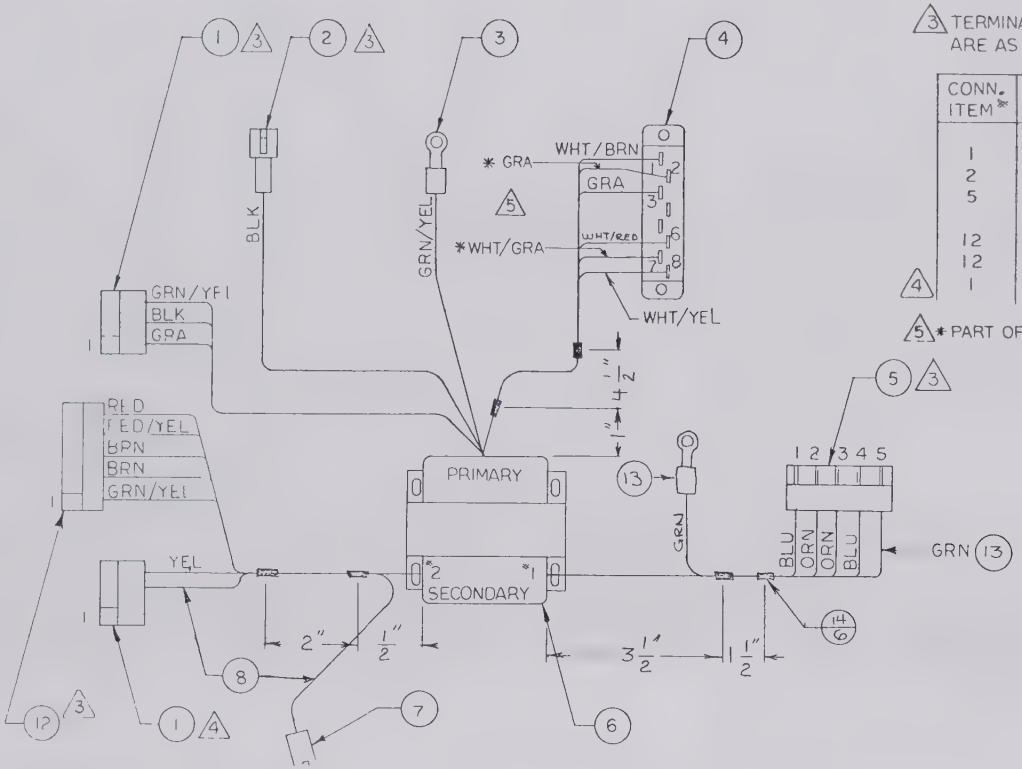
Item No. Ref. Des.	B & L Part No.	Description	Item No. Ref. Des.	B & L Part No.	Description
1	A332201-344	LATCH & SPRING ASS'Y	20	C332201-106	HEAT SINK
3	B332226-101	ELECTRICAL PLATE	21	B332201-232	MOTOR SHIELD
4	S332225-277	FUSE, 2 1/2ASB 125V	22	S332201-244	9/64 DIA. DOWEL PIN X 1 LG.
5	S333083-737	FUSE, 1 1/4ASB 250V	23	B332201-681	MOTOR ASS'Y
6	C332201-605-401	P.W. BD. ASS'Y	24	C332225-104	LENS B ASS'Y
7	B332201-612-4	FLEX. CIRCUIT ASS'Y	25	B332201-028	COND. LENS
8	B332201-676	OUTPUT JACK ASS'Y	26	B332201-224	SPRING
9	S332201-249	#4 SELF TAP X 1/2 LG.	27	B332201-254	SPRING
11	B332225-133	ENTRANCE SLIT	28	B332201-731	SWITCH ASS'Y
12	N333172-118	#8 SELF TAP BT X 1/2 LG.	29	C332201-731	SPRING, TORSION
13	C332226-641	TRANSFORMER ASS'Y	30	B332201-146	FILTER MOUNT ASS'Y
14	B332201-677	POWER CORD ASS'Y	31	S342501-473	8 - 32 X 3/8 LG.
15	S332201-250	#6 SELF TAP X 3/8/ LG.	32	S332201-246	6 - 32 X 3/8 LG
16	R332201-105	BASE	33	D332201-614-4	FLEX. CIR. ASS'Y
17	S333172-119	#6 SELF TAP BT X 1/2 LG.	34	B332225-110	EXIT SLIT ASS'Y
18	B332201-223	SYNC DET. ASS'Y	35	B332225-102	MIRROR B ASS'Y
19	C332201-724	HEAT SINK ASS'Y	36	A332201-269	PAD

Date Rev. Letter	List of Parts for 332226-15001 BASE ASS'Y	BAUSCH & LOMB	332226-15003

Item No. Ref. Des.	B & L Part No.	Description	Item No. Ref. Des.	B & L Part No.	Description
37	C332201-204	SENSOR COVER	59	B332201-283	INDEX PLATE ASS'Y
38	A332201-189	SPRING	60	S332959-136	TRUARC 5103-31 MD
39	S332201-285	GROOV-PIN 3/64 DIA. X 5/16 LG.	62	B332225-121	CAM ASS'Y
			63	S332201-245	8 - 32T X 2 3/4 LG.
40	C332201-203	SHROUD	64	A332201-207	SPACER
41	C332223-603-601	SENSOR ASS'Y	65	C332201-227	FRONT PLATE
42	B332225-101	MIRROR ASS'Y	66	A332201-312	WASHER
43	B332201-257	SPRING	67	A332201-209	FOOT
44	D332201-119	MONO COVER	68	B332201-329	STRAP ASS'Y
47	C332201-1007	BD. & BRK. ASS'Y	69	D332201-102	FOLLOWER
48	S343022-270	4 - 40 X 3.8 LG.	70	S332201-165	.1875 NA STAINLESS BALL
49	A332201-289	TY-RAP			
50	B332201-219	GUARD ASS'Y	71	B332201-148	GRATING ASS'Y
53	N332201-292	KNOB ASS'Y	72	B332201-607-4	FLEX. CIRCUIT ASS'Y
54	N332201-291	KNOB ASS'Y	73	B332225-119	CLAMP
56	D332201-201	PLATE	74	B332225-606-3	CONNECTOR BOARD
57	B332201-273	BASE COVER ASS'Y	75	B332225-106	MIRROR MOUNT ASS'Y
58	B332201-180	COVER			

Date Rev. Letter	List of Parts for 332226-15001 BASE ASS'Y	BAUSCH & LOMB	332226-15004

Item No. Ref. Des.	B & L Part No.	Description
76	A332201-260	SPRING
77	C332225-602-401	P.W. BD. ASS'Y
78	A332201-270	PAD
79	S332201-279	TINNERMAN C21457-025-37?
80	A332201-271	CAP
81	B332225-157	GROUND PLATE
82	S344001-305	6 - 32T x 1/4
83	S332501-1181	#6 EXT. TOOTH LOCK WASHER
84	B332201-315	PLATE
85	B332201-286	INSULATOR
86	B332201-1625	WIRE ASS'Y
87	B332201-293	STANDOFF
88	B332225-15801	GRATING ASS'Y
89	S214325-379	#4 SELF TAP 3/8 LG. SCREW
90	B332201-300	SPRING ASS'Y
91	A332201-316	OCCLUDER
92	A332201-320	CLIP
93	A332201-317	SCREW DRIVER
94	A332201-319	CLIP
95	S338640-190	WASHER #10
96	S334558-401	#8 - 32T x 1/2 LG. SCR.
99	B332201-267	WASHER
100	B332201-310	LABEL
101	B333083-163	LABEL
102	B332225-281	LABEL
103	B332201-135	LABEL



3 TERMINALS USED IN CONNECTORS ARE AS FOLLOWS:

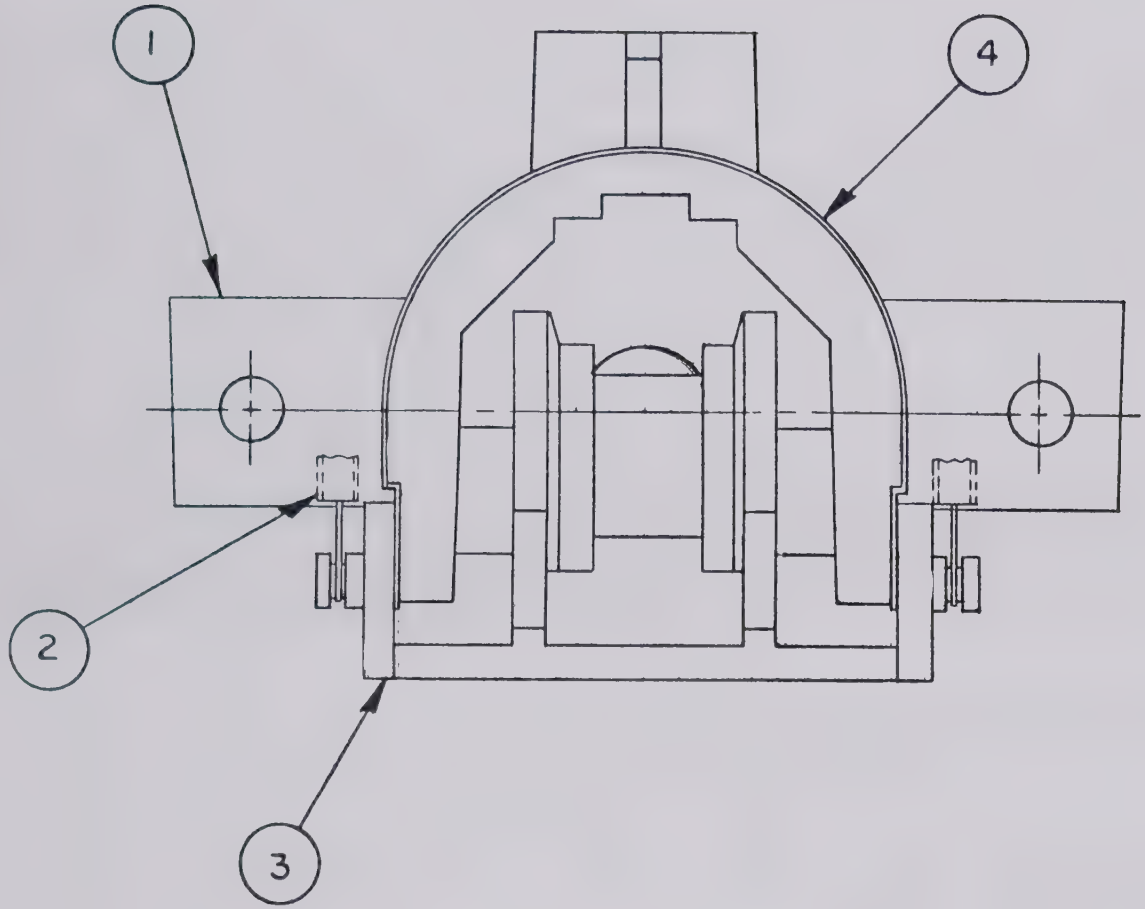
	CONN. ITEM *	TERM. ITEM *	UNIT
	1	9	3
	2	11	1
	5	10	4
	12	9	4
	12	11	1 PIN *1
4	1	9	1

5 * PART OF ITEM *4

	WIRE	LG.	STRIPPING	TERM ITEM *	CONN ITEM *
	GRN/YEL	4"	1/4	*9	*1
	BLK	4"	1/4	*9	*1
	GRA	4"	1/4	*9	*1
	BLK	4"	1/4	*11	*2
	GRN/YEL	4"	1/4	*3	—
	WHT/BRN	7"	1/4 (T)	—	—
	GRA	7"	1/4 (T)	—	—
	WHT/RED	7"	1/4 (T)	—	—
	WHT/YEL	7"	1/4 (T)	—	—
SECONDARY *1	BLU	6"	1/4	*10	*5
SECONDARY *1	BLU	6"	1/4	*10	*5
SECONDARY *1	ORN	6"	1/4	*10	*5
SECONDARY *1	ORN	6"	1/4	*10	*5
SECONDARY *2	YEL	5"	1/4	*9	*1
SECONDARY *2	RED	4"	1/4	*9	*12
SECONDARY *2	RED/YEL	4"	1/4	*9	*12
SECONDARY *2	BRN	4"	1/4	*9	*12
SECONDARY *2	BRN	4"	1/4	*9	*12
SECONDARY *2	GRN/YEL	4"	1/4	*11	*12

C332226-641-D
TRANSFORMER ASS'Y

ITEM NO.	B+L PART NO.	DESCRIPTION
14	N333040-969	PANDUIT SST'M
13	B332201-1628	WIRE ASS'Y
12	N333083-741	RECEPTACLE MOLEX 1653R-1
11	S370302-765	TERM MOLEX 1380
10	A332201-721	TERM
9	S333083-658	TERM MOLEX 1381
8	B332226-1601	WIRE ASS'Y.
7	A332201-728	RECEPTACLE
6	C332225-641	TRANSFORMER
5	A332201-729	CONNECTOR
4	B332201-604-6	FUSE BD. ASS'Y
3	N532364-196	TERM ETC AA-232-06X-T
2	A332201-725	CONNECTOR
1	N332650-1302	CONN MOLEX 1396R-1



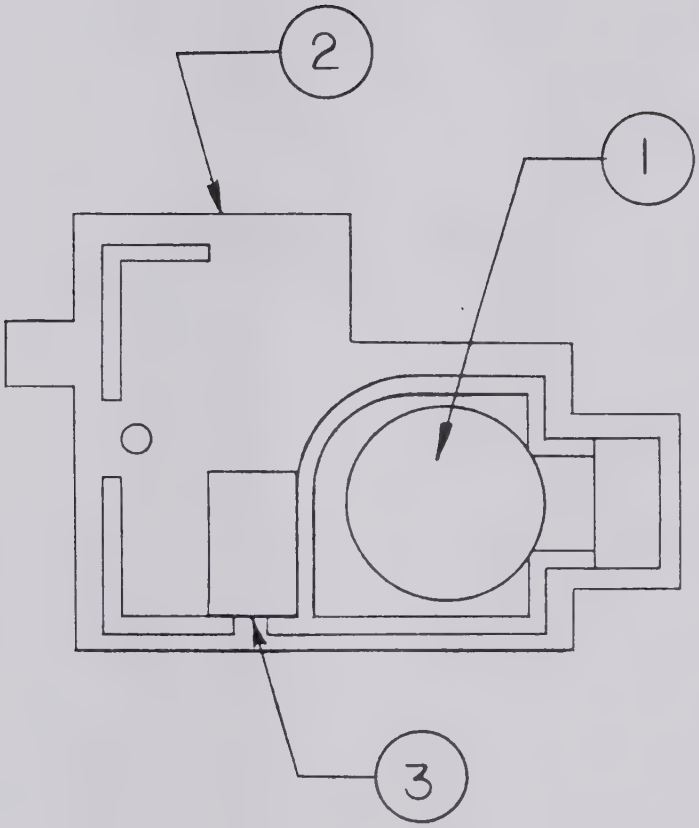
ITEM NO	B&L PART NO.	DESCRIPTION
4	B332201-297	RETAINER
3	C332201-255	CHUTE
2	A332201-259	SPRING
1	D332201-118	SAMPLE COMPARTMENT

TAB A
TABLE OF CONTENTS

Title	Page
Base Cover Assembly 332201-273	
Parts List	A-2
Drawing	A-3
Switch Assembly 332201-731	
Parts List	A-4
Drawing	A-5
AMP/Detector P.C. Board Assembly 332201-6204	
Parts List	A-6
Drawing	A-7
Schematic (Meter) 332225-60003	A-9
Schematic (Digital) 332201-60008	A-11
Transformer Assembly 332202-651	
Parts List	A-14
Drawing	A-15
Flex Circuit Assembly 332225-683	
Parts List	A-16
Drawing	A-17
Cable Assembly 332225-1627	
Parts List	A-18
Drawing	A-19
Potentiometer Board Assembly 332225-6074	
Parts List	A-20
Drawing	A-21
Stage Assembly 332230-150	
Parts List	A-24
Drawing	A-25
Model 332242 Cover Assembly 332242-170	
Parts List	A-28
Drawing	A-29
Model 332242 Main Assembly 332242-200	
Parts List	A-32
Drawing	A-33, 35
GPSC Cover Assembly 332244-135	
Parts List	A-38
Drawing	A-39
GPSC Main Assembly 332244-200	
Parts List	A-40
Drawing	A-41

BASE COVER ASSEMBLY
332201-273, Rev. C

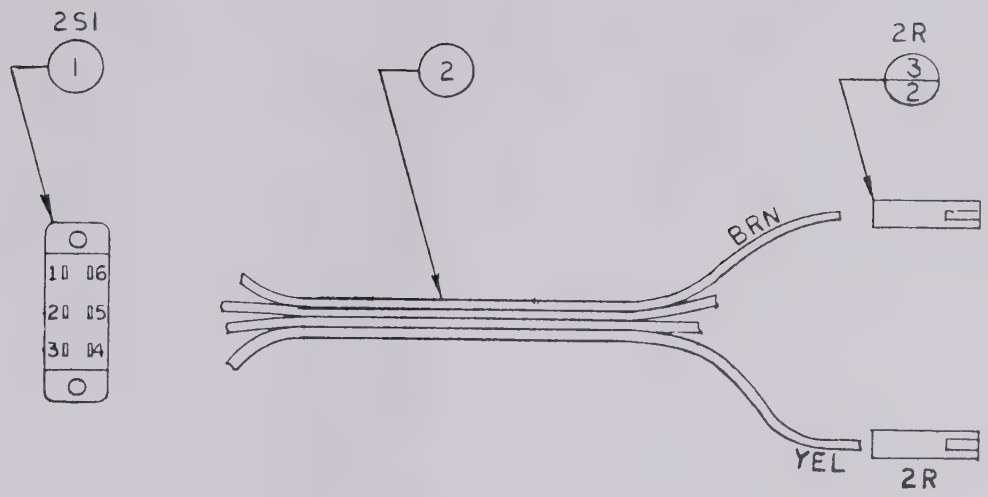
Item No.	Part No.	Description
1	332201-199	Cap
2	332201-253	Base Cover
3	332201-269	Pad



BASE COVER ASSEMBLY
332201-273 REV. C

SWITCH ASSEMBLY
332201-731, Rev. H

Item No.	Part No.	Description
1	332201-699	Switch
2	332201-1601	Wire Assembly
3	332201-728	Receptacle



COLOR	FROM	TO
BRN	2SI- 3	2R-
RED	2SI- 5	2P-2
ORN	2SI- 2	2P-1
YEL	2SI- 4	2R-

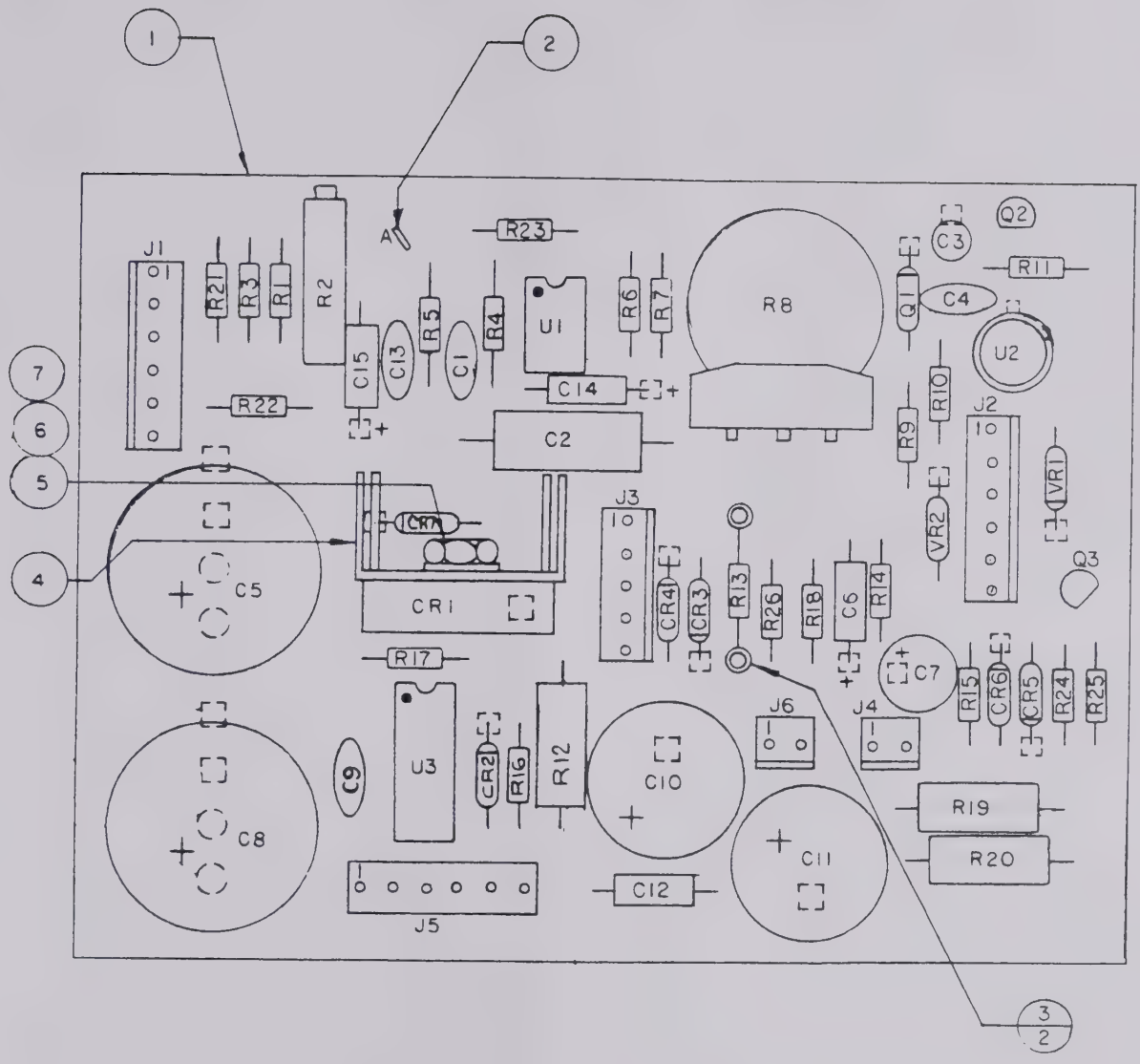
SWITCH ASSEMBLY

332201-731 REV. H

AMP/DETECTOR PC BOARD ASSEMBLY
332201-6204, Rev. H

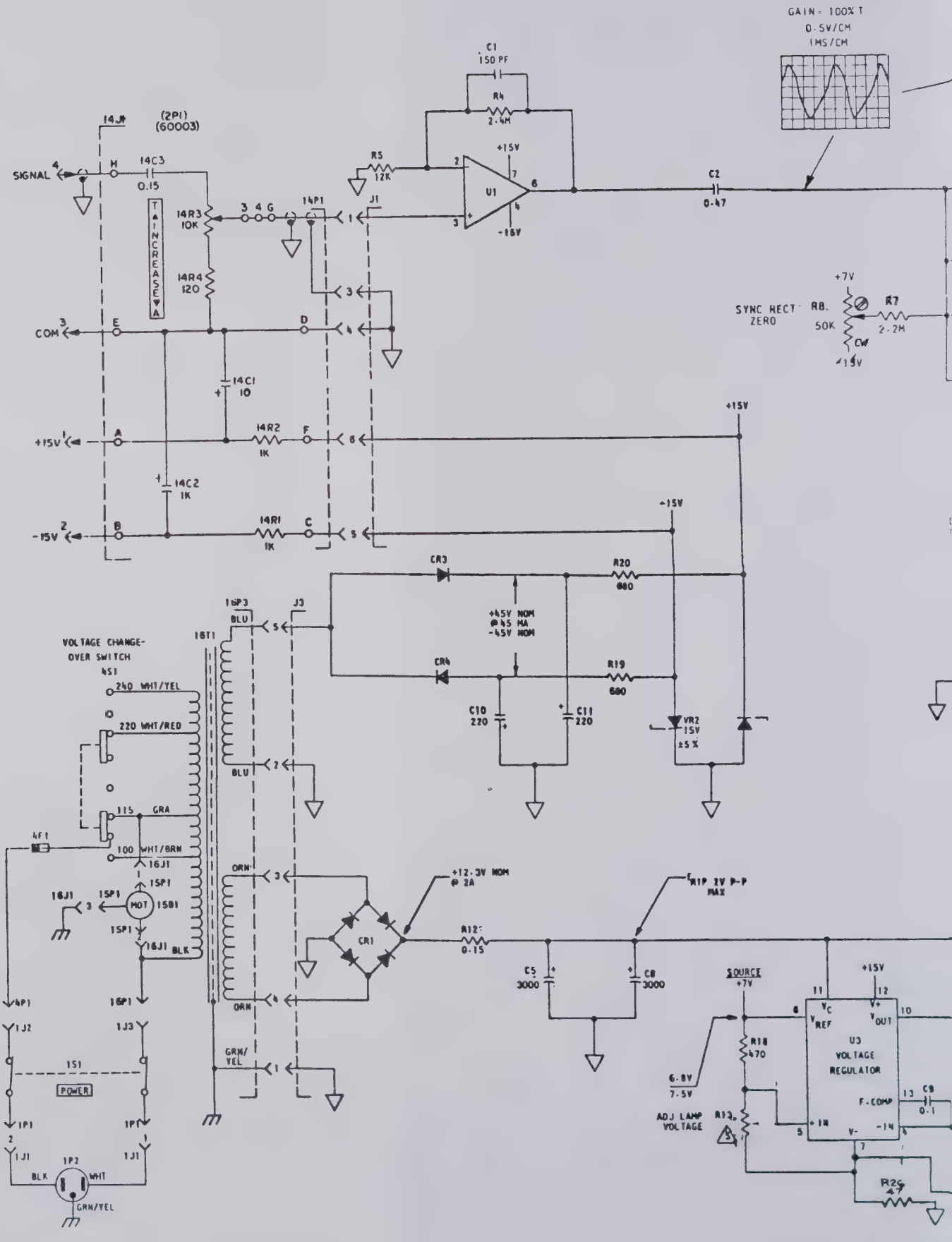
Item No.	Part No.	Description
C1	N333060-1061	Capacitor, Disc Ceramic 150 PF ±10%, 500V
C2	A332201-777	Capacitor, Polycarbon, 1 MFD 50V ELPAC #C5B105K
C3	A331001-671	Capacitor, Tant. Radial Type, 15 MFD ±20%, 10V Dickson Type GSD
C4	Same as C1	
C5	A332201-757	Capacitor, Elect 3000 MFD −10%, +100% 20V Temple Type 411
C6	A332201-758	Capacitor, Tant. 1 MFD ±20%, 10V Dickson Type GSAX
C7	A332201-641	Capacitor, Elect. Radial Type, 68 MFD −20% +100% 20V, Temple Type 411
C8	Same as C5	
C9	S333097-650	Capacitor, Disc Ceramic .1 MFD +80% −20% 10V Centralab Ultra-Kap
C10	A332201-760	Capacitor, Elect. Radial Type, 220 MFD, −20% +100%, 60V Temple Type 411
C11	Same as C10	
C12	N371952-654	Cap, Film, .0047/200V
C13	N371951-684	Capacitor, Cer .01 UF/100V ±20% Sprague #T6-S10
C14	N372092-651	Capacitor, Tant 2.2 UF/29V ±10% Kemet Type T310
C15	Same as C14	
CR1	S382314-652	Rectifier, Bridge 4 Amp, 50V Motorola #MDA970-1
CR2	371930-681	Diode 1N270
CR3	S332201-748	Diode 1N4003
CR4	Same as CR3	
CR5	S332755-139	Diode, 1N914
CR6	Same as CR5	
CR7	333172-789	Diode, 1N823
J1	S332225-646	Wafer, 6-Pin Polarized #09-60-1061
J2	S332201-1008	Wafer, 6-Pin, Locking Molex #09-65-1061
J3	S332201-789	Wafer, 5-Pin Polarized Molex #09-60-1051
J4	S332201-746	Wafer, 2-Pin Polarized Molex #09-60-1021
J5	S332201-744	Wafer, 6-Pin #09-64-1061
J6	Same as J4	
Q1	S333060-1254	Diode, Zener #1N5235B
Q2	S332201-664	Transistor, 2N5555
Q3	S331011-647	Transistor, 2N3904

Item No.	Part No.	Description
R1	S332201-1019	Resistor, Comp. 3.6K ±5% ¼W
R2	S333060-784	Potentiometer, 5K Trimpot
R3	S332201-735	Resistor, Comp. 11K, ±5%, ¼W
R4	S332224-648	Resistor, Cermet 2.4M ±1%, ¼W
R5	S333060-659	Resistor, Metal Film 12.1K ±1% ¼W
R6	S344001-867	Resistor, Metal Film 3.01K ±1% ¼W
R7	S344002-929	Resistor, Comp., 2.2M, ±5% ¼W
R8	C332201-750	Potentiometer, 50K
R9	S371952-647	Resistor, Comp., 27K, ±5%, ¼W
R10	S371952-650	Resistor, Comp., 33K, ±5%, ¼W
R11	S371951-661	Resistor, Comp., 100K, ±5%, ¼W
R12	A333172-731	Resistor, Wire Wound .15 OHMS ±5%
R13	See Note 6	
R14	S371957-666	Resistor, Comp., 4.7K, ±5%, ¼W
R15	S371957-651	470 OHMS ±5%, ¼W
R16	Same as R15	
R17	S342501-1495	Resistor, Comp., 1K ±5%, ¼W
R18	Same as R15	
R19	A332201-749	Resistor, Wire Wound 680 OHMS ±5%, 4W
R20	Same as R19	
R21	371951-673	Resistor, Comp., 1.2K, ±5%, ¼W
R22	S371957-642	Resistor, Comp. 330 OHMS ±5%, ¼W
R23	Same as R22	
R24	S371951-648	Resistor, Comp., 3.3K, ±5%, ¼W
R25	Same as R24	
R26	371957-661	Resistor, Comp., 47 OHMS, ±5%, ¼W
U1	S333172-651	Operational Amplifier High Performance Signetics #UA741CV
U2	S333070-745	Operational Amplifier LM301AH, Nat. Semi.
U3	S332201-1053	Precision Voltage Reg. Fairchild UA723DC or Silicon Gen. #SG723CN
VR1	S332201-673	Diode, Zener, 15V, 1W 1N4744A
VR2	Same as VR1	
1	D332201-6203	AMP/Detector PC Board
2	N344001-718	Terminal, Quick—Connect, AMP #61134-1
3	A332201-651	Terminal, Turret, Cambridge #1558-3
4	A332201-652	Heatsink, IERC #PB1-2CB
5	S343022-117	Screw, 6-32T x ½ Lg Slot Pan Hd
6	S333060-351	Washer, #6 Belleville
7	S332979-233	Nut, #6 Keps

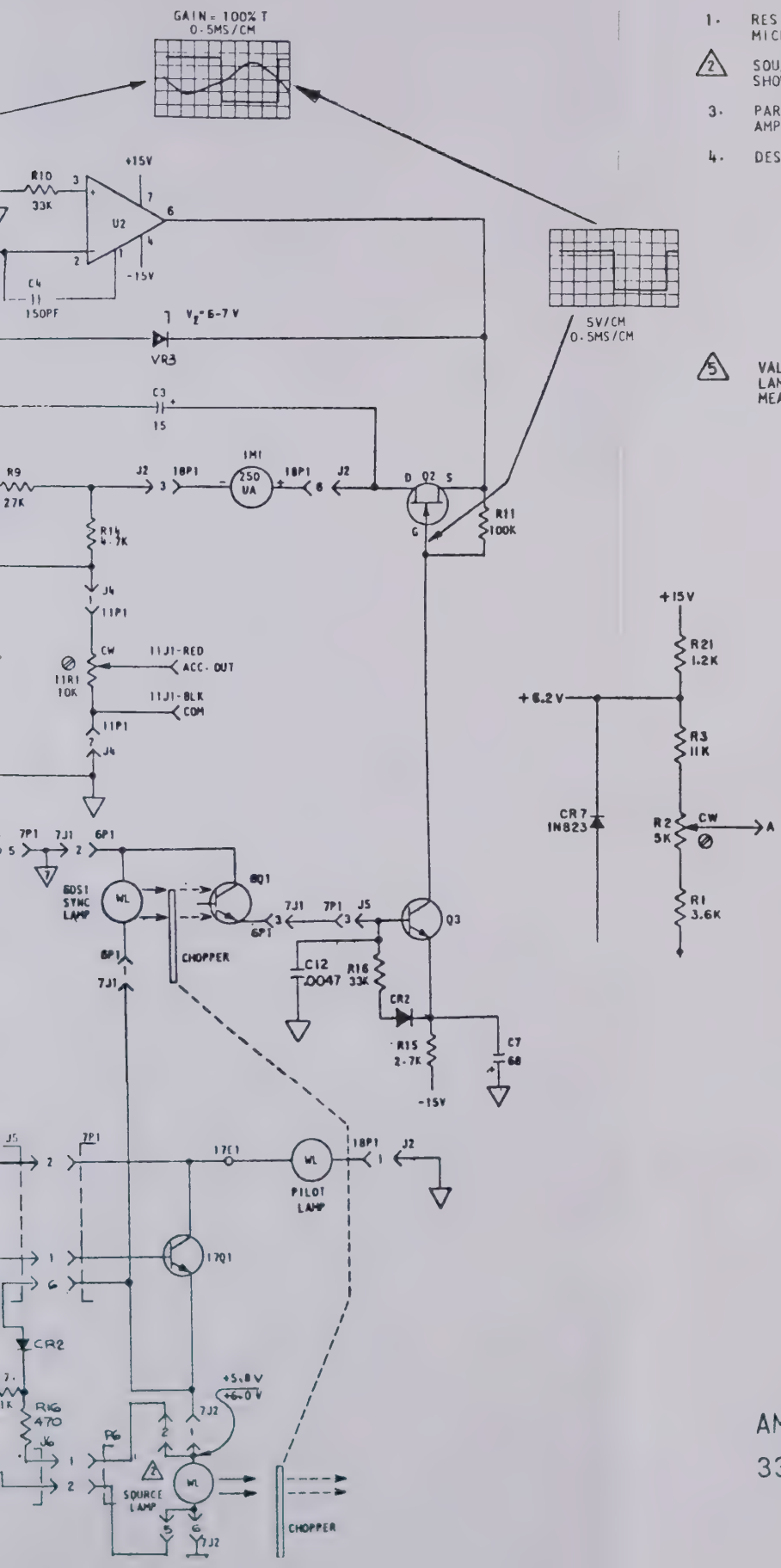


AMP DETECTOR BOARD ASSEMBLY

332201-6204 REV. H



332201-10020



1. RESISTOR VALUES IN OHMS; CAPACITOR VALUES IN MICROFARADS.

2. SOURCE LAMP CONNECTIONS IN UV INSTRUMENTS ARE SHOWN ON UV POWER SUPPLY SCHEMATIC -60004.

3. PARTIAL REFERENCE DESIGNATORS ARE PREFIX 5 - AMP/DETECTOR BOARD.

4. DESIGNATORS PREFIXED -

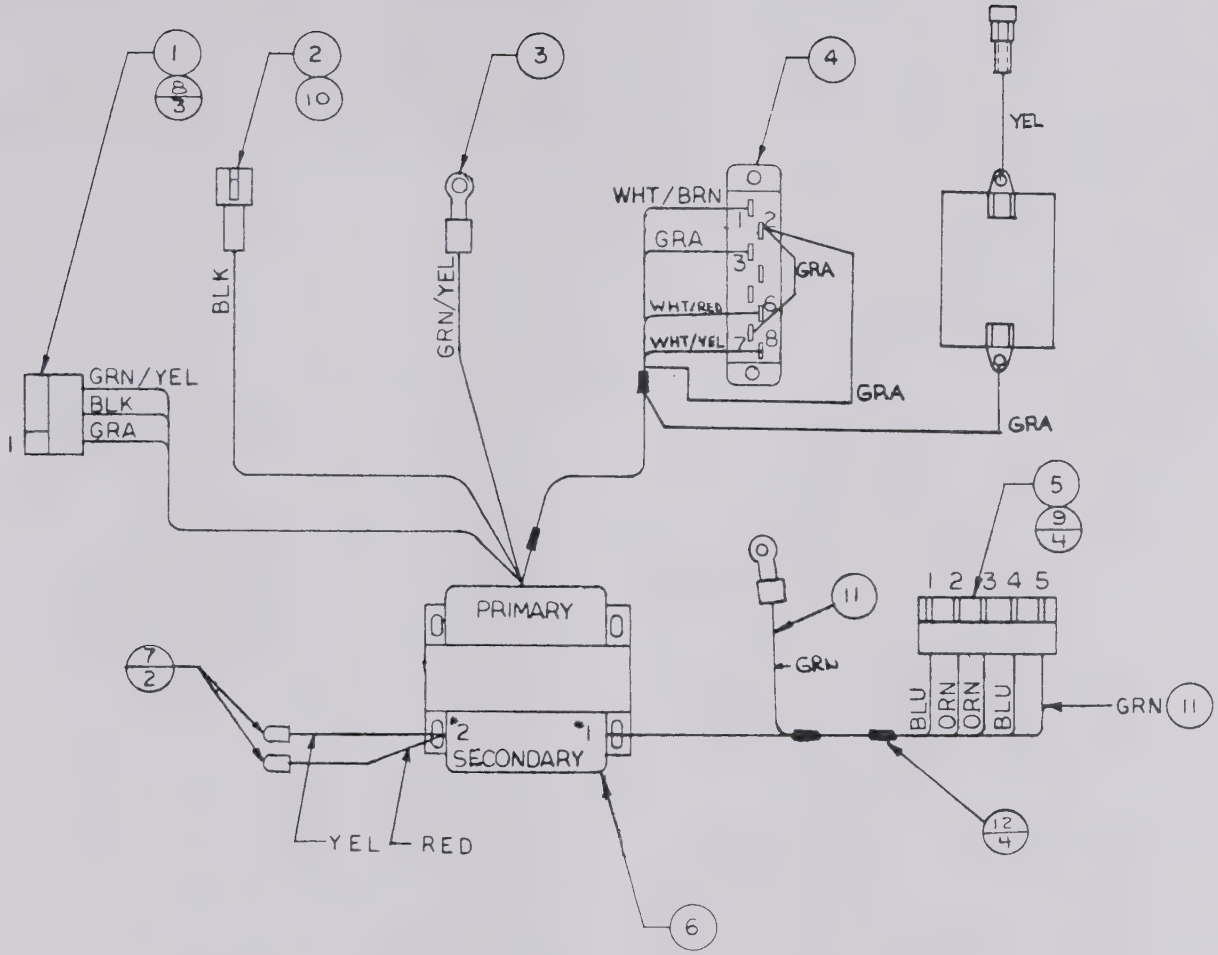
1.	ARE	ON POWER CORD ASSEMBLY
4	"	" FUSE BOARD ASSEMBLY
6	"	" SYNC-DETECTOR ASSEMBLY
7.	"	" FLEX. CIRCUIT -607
11	"	" ANALOG OUTPUT JACK ASSEMBLY
14	"	" FLEX. CIRCUIT -614
15	"	" MOTOR ASSEMBLY
16	"	" TRANSFORMER ASSEMBLY
17	"	" HEAT SINK ASSEMBLY
18	"	" METER CABLE ASSEMBLY
12.	"	" FLEX CIRCUIT -612

5. VALUE OF R 13 TO BE SELECTED TO PROVIDE LAMP VOLTAGE BETWEEN 5.89V AND 6.0V, MEASURED AT THE SOURCE LAMP.

AMP/DETECTOR SCHEMATIC
332225-60003 REV. L

TRANSFORMER ASSEMBLY
332202-651, Rev. D

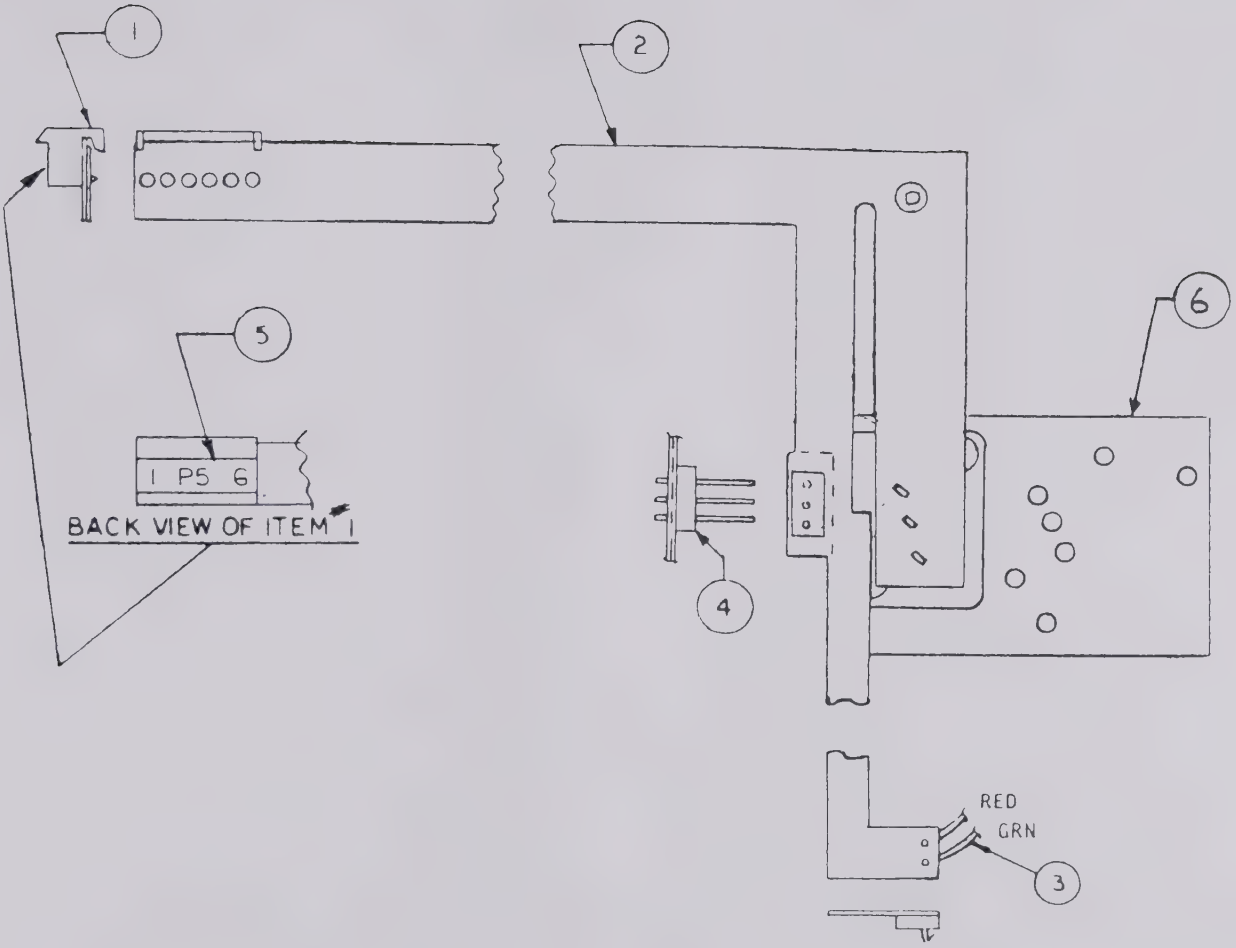
Item No.	Part No.	Description
1	332650-1302	Connector, Molex 1396R-1 Standard 3 Pin
2	332201-725	Connector, Recep 1 Pin
3	333172-726	Terminal, Ring 22-18 #6 Scr
4	332201-6044	Fuse Board Assembly
5	332201-729	Connector
6	332201-1085	Transformer
7	381429-205	Terminal, Cap, 22-18 Awg Red, LC78-2
8	333083-658	Terminal, Molex 1381, Female 18-22 Crimp
9	332201-721	Terminal, Crimp 18-24
10	370302-765	Terminal, Molex 1380, Male 18-22 Crimp
11	332201-1628	Wire Assembly
12	333172-724	Ty-Rap



TRANSFORMER ASSEMBLY
332202-651 REV. D

FLEX CIRCUIT ASSEMBLY
332225-683, Rev. B

Item No.	Part No.	Description
1	344002-783	Connector, 6-Pin Molex #09-52-3061
2	332201-6073	Flex Circuit
3	332201-1622	Wire Assembly
4	332201-787	Wafer, 6-Pin Molex #09-52-1031
5	332201-332	Label
6	332225-644	Heatsink Assembly

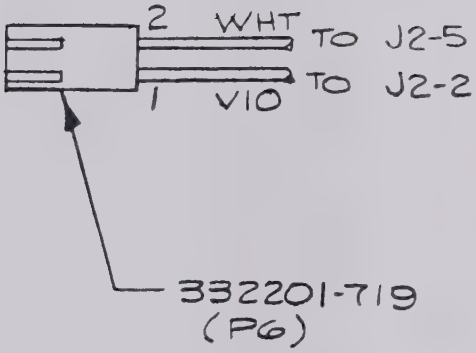


FLEX CIRCUIT ASSEMBLY
332225-683 REV. B

CABLE ASSEMBLY
332225-1627

Item No.	Part No.	Description
1	332225-1628	Wire Assembly
2	332201-719	Connector Plug, 2-Pin .156

WIRES AND TERMINALS ARE PART
OF 332225-1628, WIRE ASSEMBLY.

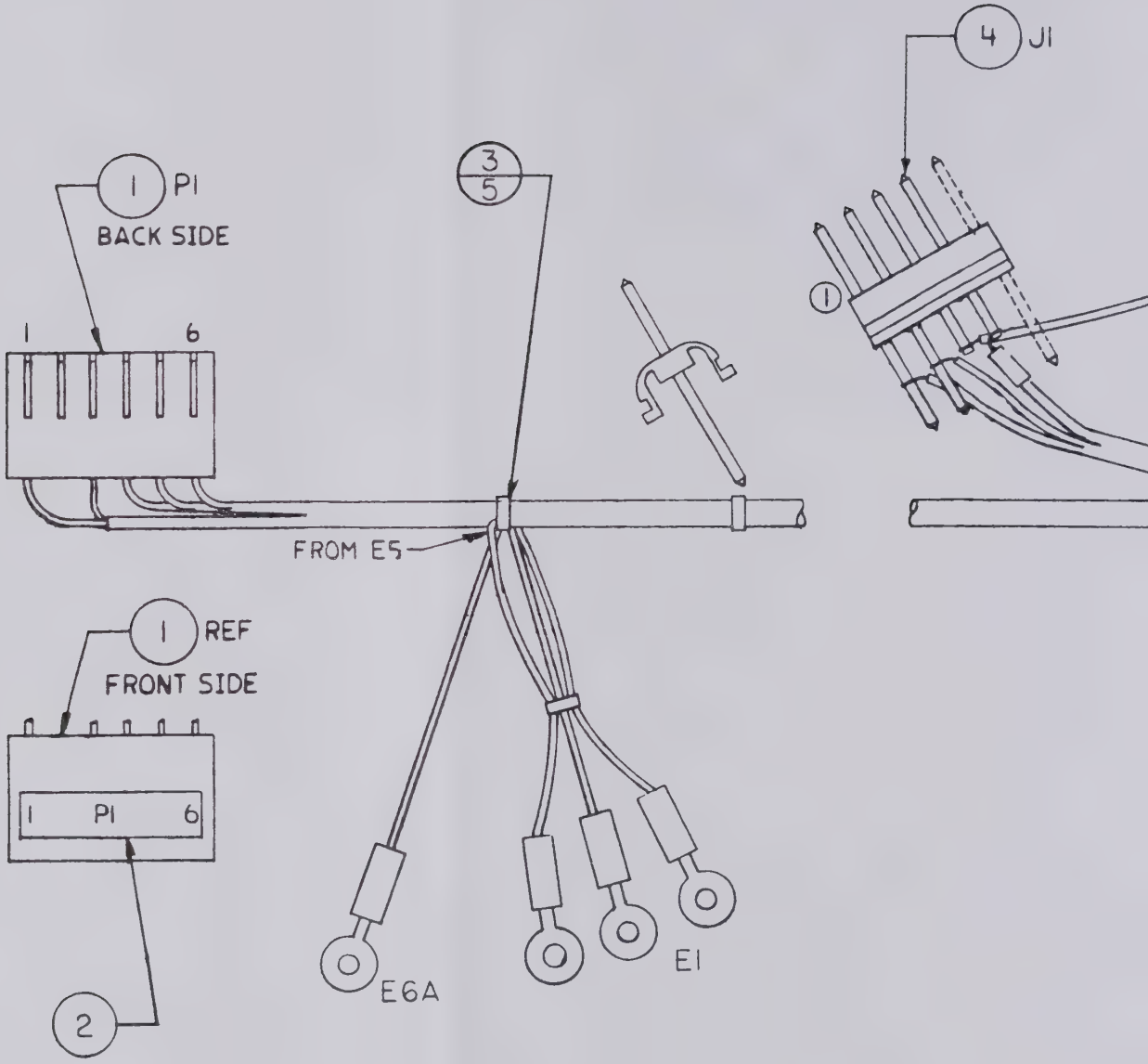


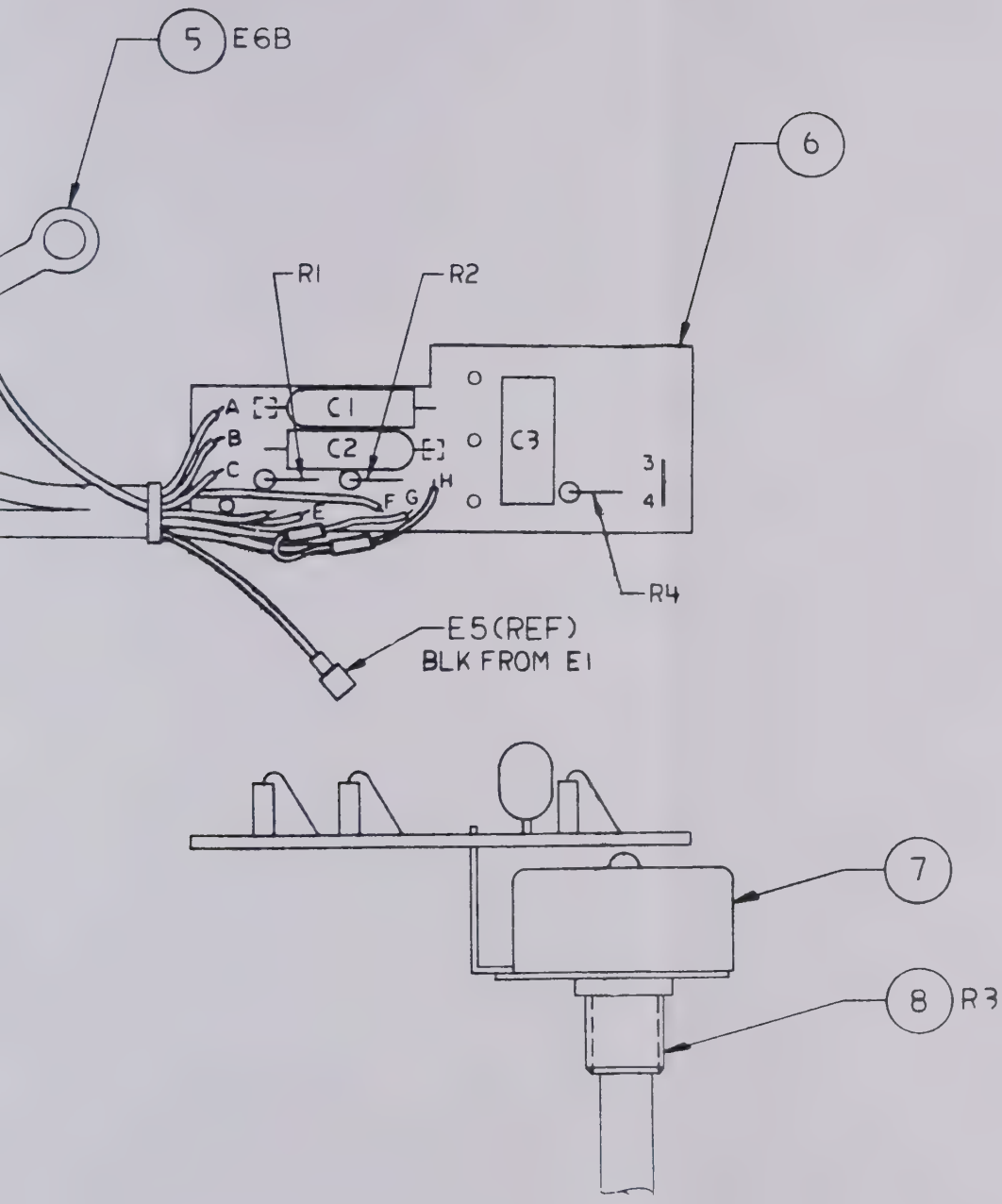
CABLE ASSEMBLY
332225-1627 REV. A

POTENTIOMETER BOARD ASSEMBLY
332225-6074, Rev. D

Item No.	Part No.	Description
C1*	N371930-736	Capacitor, Tant., 10 MFD 20V Kemet T310
C2*	Same as C1	
C3*	A332201-754	Capacitor, Film, .15 MFD 100V
R1*	S342501-1495	Resistor, Carbon Film 1K 5% ¼W
R2*	Same as R1	
R4*	S371950-673	Resistor, Carbon Film 68 OHMS 5% ¼W
1	S332225-660	Connector, 6 Pin, Molex #09-50-7061
2	B332201-331	Label
3	N333040-969	Sta-Strap, Panduit #SST1M
4	S339090-757	Wafer, 5 Pin, Molex #09-57-1050
5	N343001-1806	Terminal, Locking for #6 Screw, Shakeproof #2153-06-00
6*	B332201-6183	Potentiometer PC Board
7	A332201-271	Cap, Sinclair & Rush #.875-8
8	C332201-738	Potentiometer
9	D332225-1616	Wire Assembly
10*	A332225-1610	Wire Assembly

*Part of Item 332225-1625

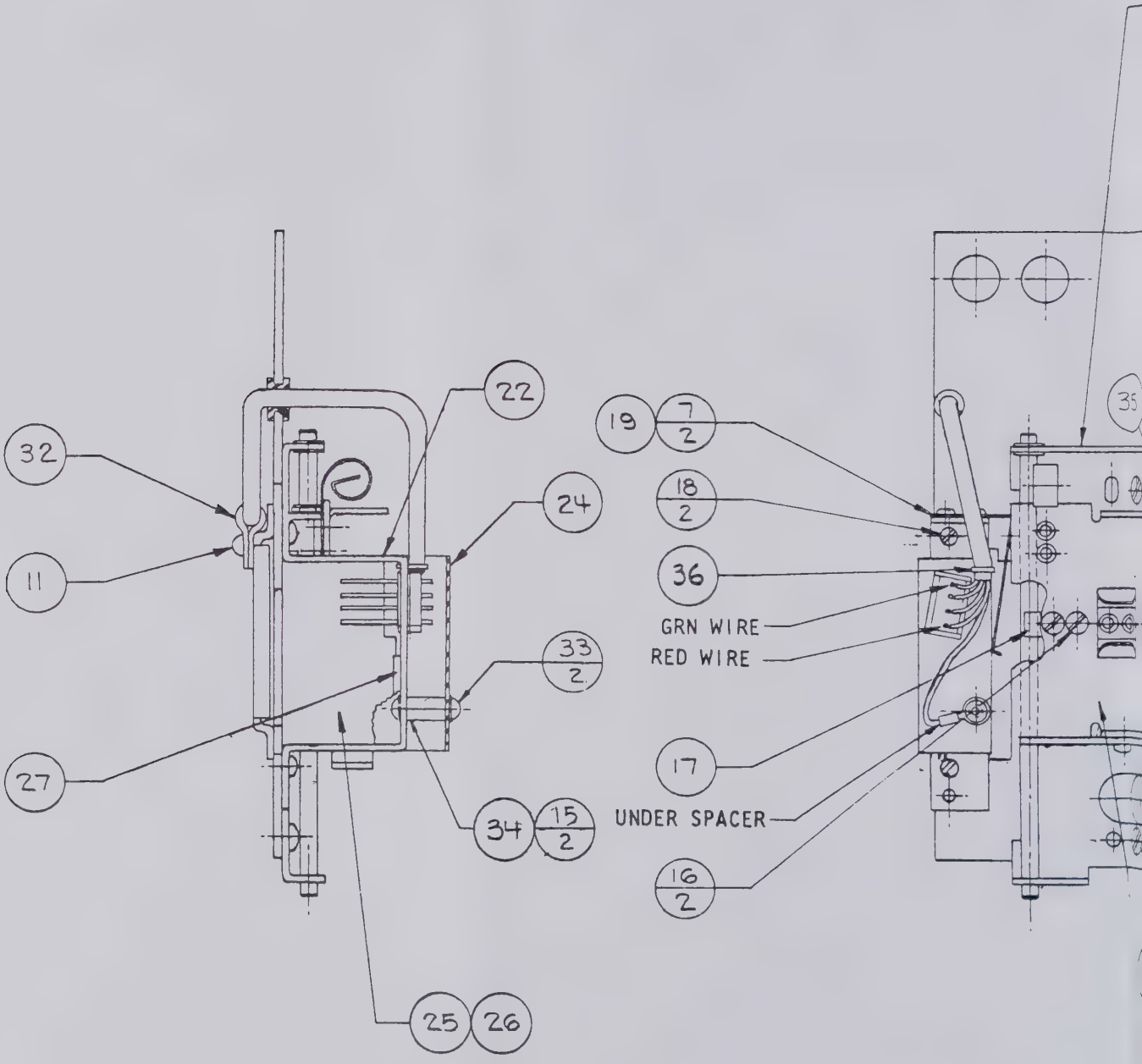

4 J1
1
3
5
1 P1
BACK SIDE
1
6
FROM E5
1 REF
FRONT SIDE
1 P1 6
2
E6A
E1

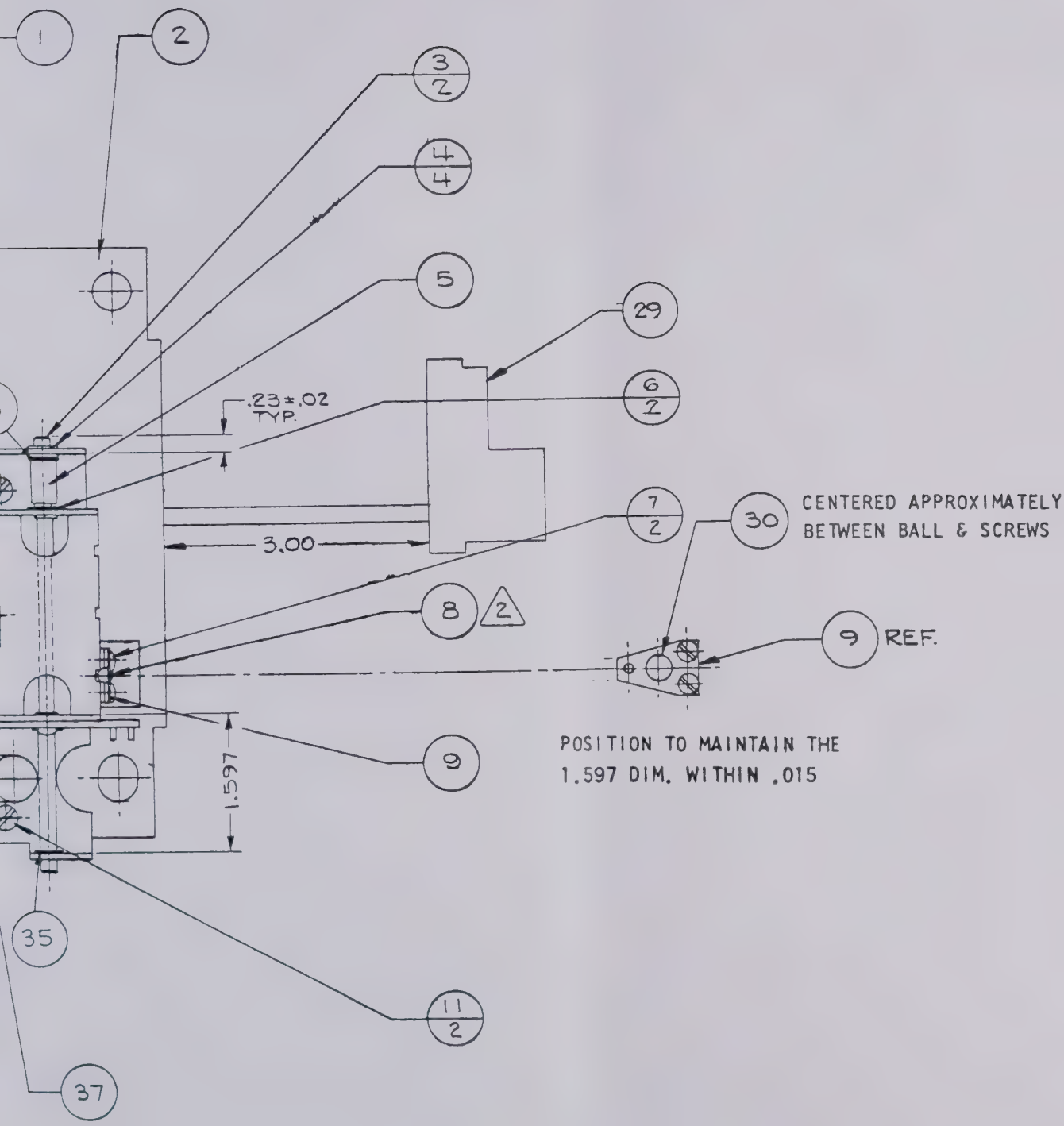


POT BOARD CABLE ASSEMBLY
332225-6074 REV. G

STAGE ASSEMBLY
332230-150, Rev. G

Item No.	Part No.	Description
1	332230-105	Stage Base
2	332230-127	Weldment
3	333002-114	Guide Rod
4	333060-315	Truarc #5555-18
5	332230-123	Spacer, H.H. Smith #8543
6	333002-130	Nyliner Bearing #311-FF
7	333003-129	Screw, #4-40 x ⅛ Slot Pan Hd.
8	333002-144	Ball .156 Dia. SST
9	332230-108	Detent Spring
10		
11	343120-210	Screw, #6-32 x 3/16 Slot Pan Hd.
12		
13		
14		
15	332650-1661	Lock Washer #4 Ext. Tooth
16	333601-459	Screw, #4-40 x 5/16 Flathead
17	332230-117	Slide
18	342501-1188	Screw, #4-40 x 3/16 Slot Pan Hd.
19	332230-122	Filter Spring
20		
21		
22	332230-107	Sensor Bracket
23		
24	332230-149	Cover
25		
26		
27	332230-124	Pad
28		
29	332230-1606	Cable Assembly
30	312515-118	Pad
31		
32	332230-153	Cable Clamp
33	333092-105	Screw, #4-40 x ¼ Pan St
34	332230-151	Spacer, ⅜L ¼D 4-40 thD
35	338675-138	Washer, Flt 12/64 12/32 032
36	333040-969	Sta-Strap, Pand
37	332230-166	Stage and Spring Assembly


32
11
27
22
24
33/2
34
15/2
25
26
19
7/2
18/2
36
GRN WIRE
RED WIRE
17
UNDER SPACER
16/2
35

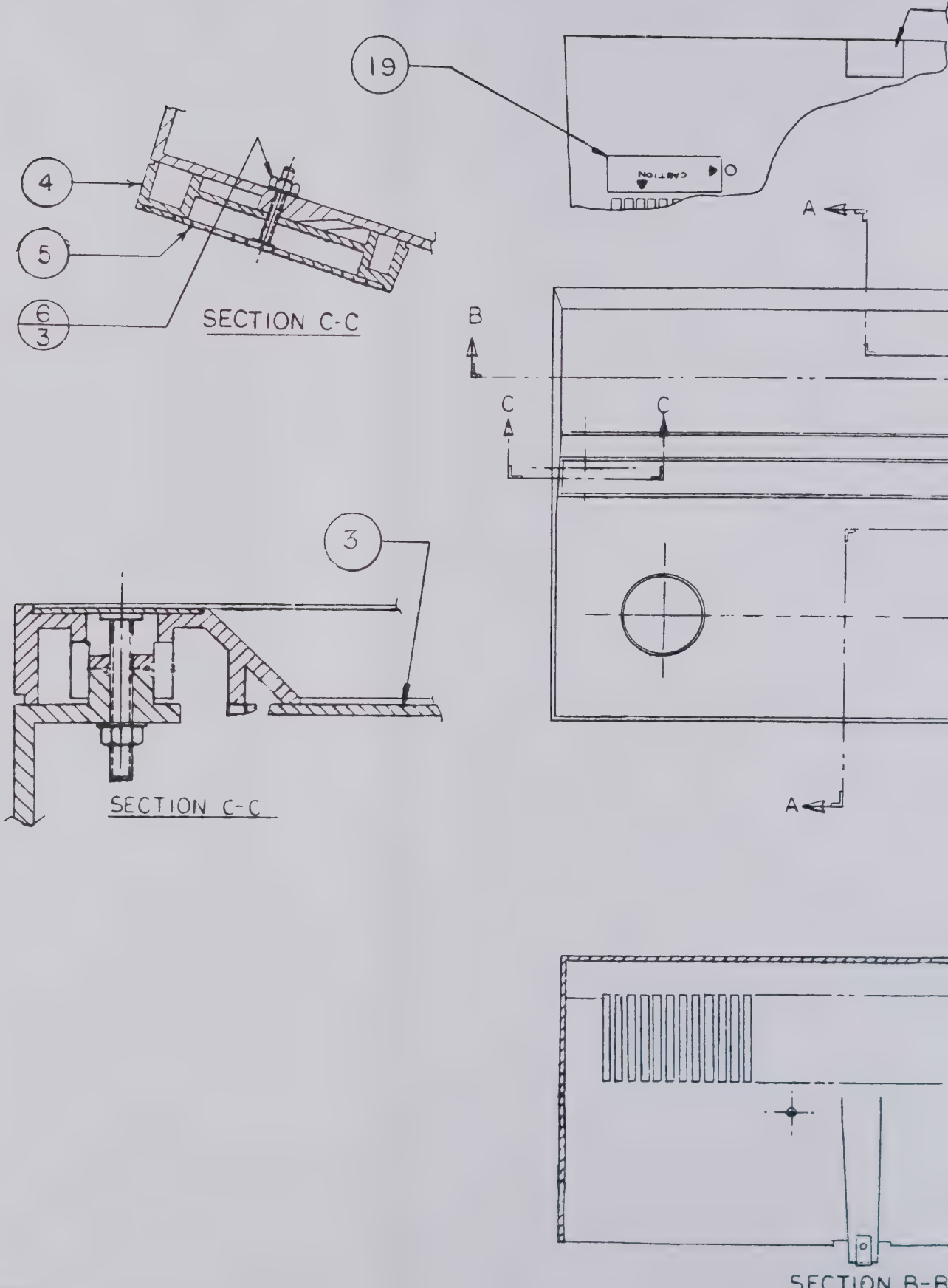


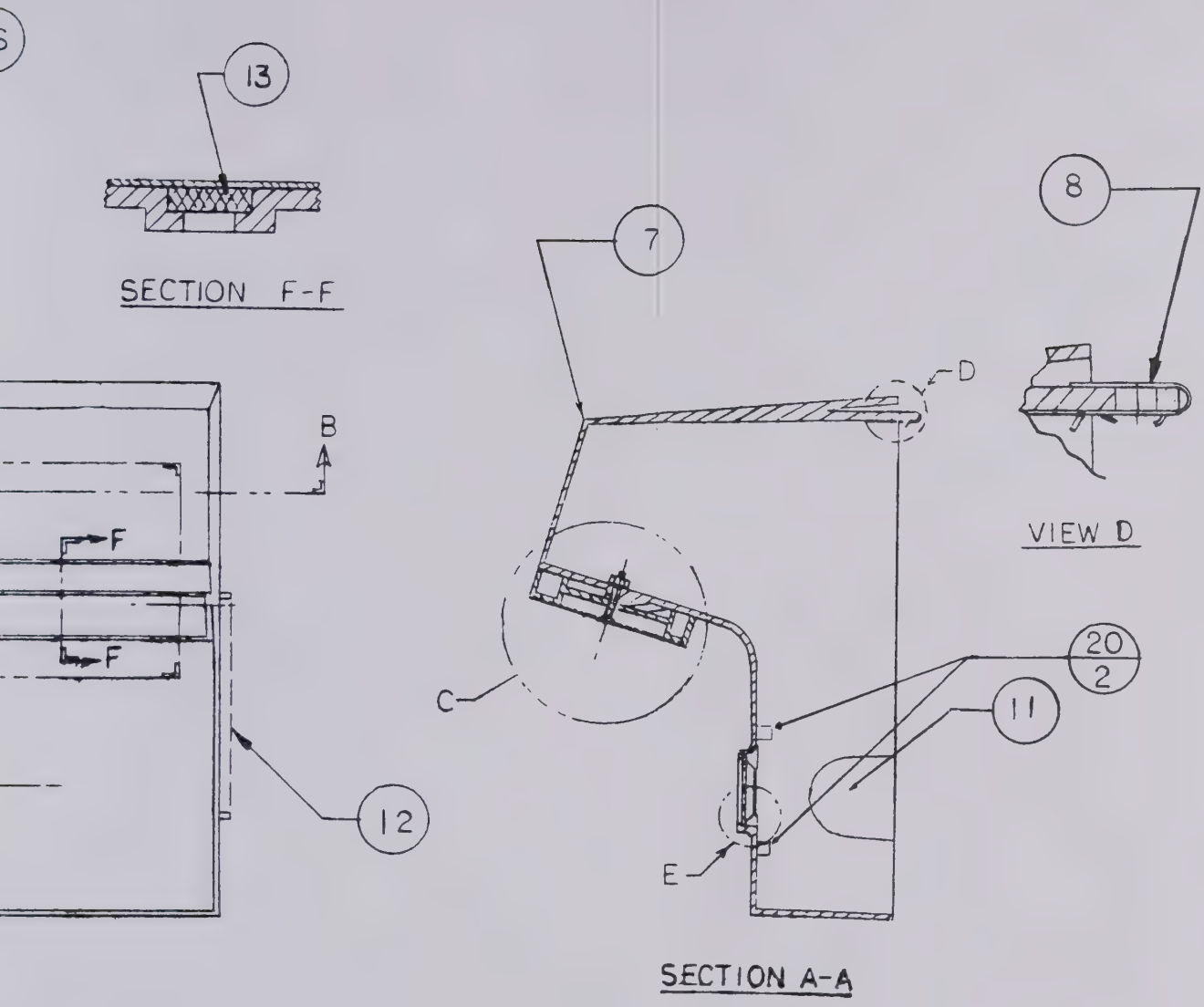
STAGE ASSEMBLY

332230-150 REV. G

MODEL 332242 COVER ASSEMBLY
332242-170, Rev. D

Item No.	Part No.	Description
3	332225-113	Window
4	332225-151	Bezel
5	332242-104	Insert
6	332979-233	Nut, Kep 6-32 St Zinc
7	332201-104	Cover
8	332201-268	Nut, Tin Utype C6438-8Z
9	332201-142	Retainer
10	332201-138	Window
11	332201-184	Plug
12	332201-125	Door
13	333172-148	Illuminator
16	332201-366	Label
17	332201-241	Plug
19	332201-247	Label
20	330000-105	Foam, 2-lb. Density

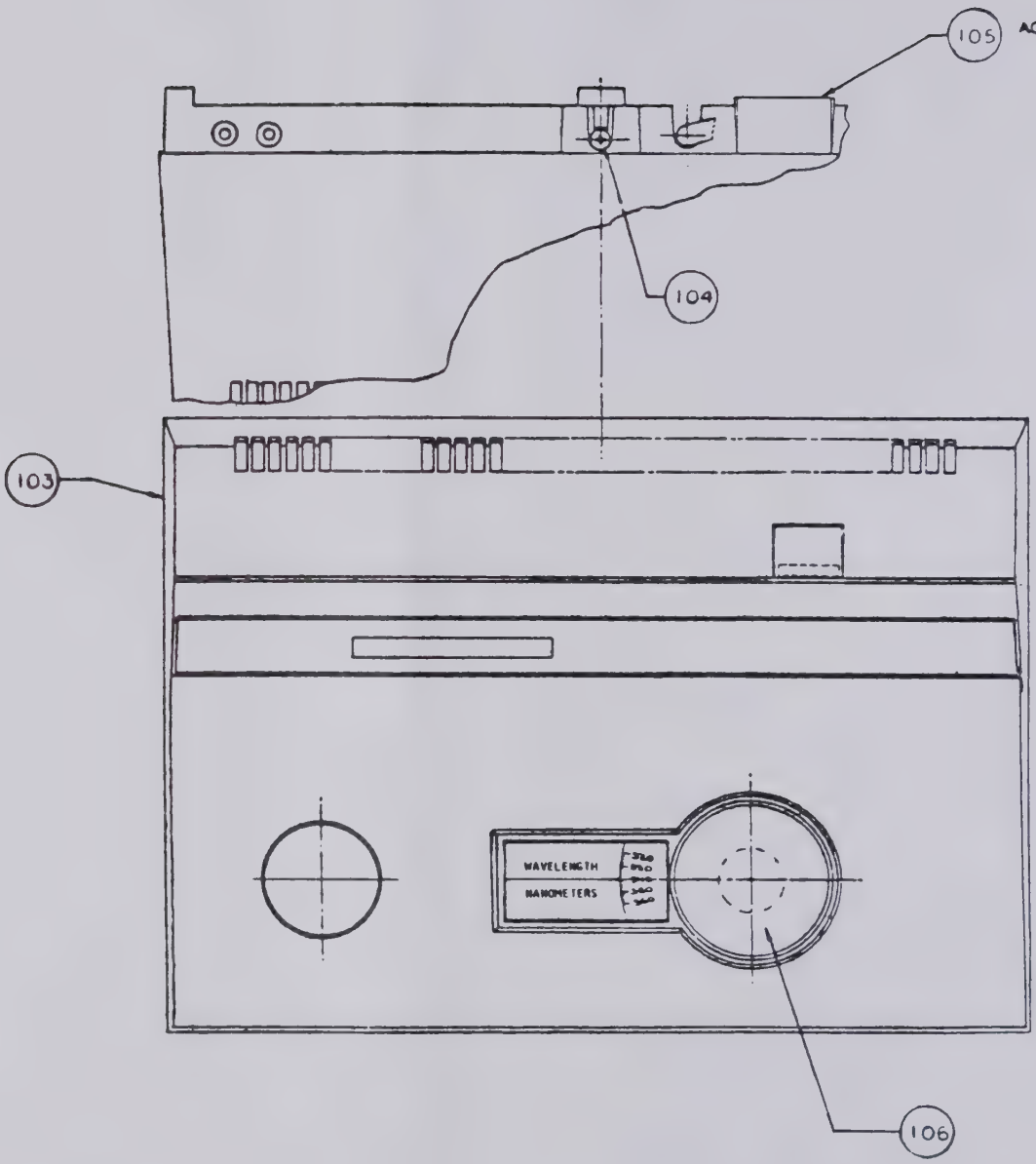

19
4
5
6
3
SECTION C-C
A
B
C
C
A
3
SECTION C-C
SECTION B-B

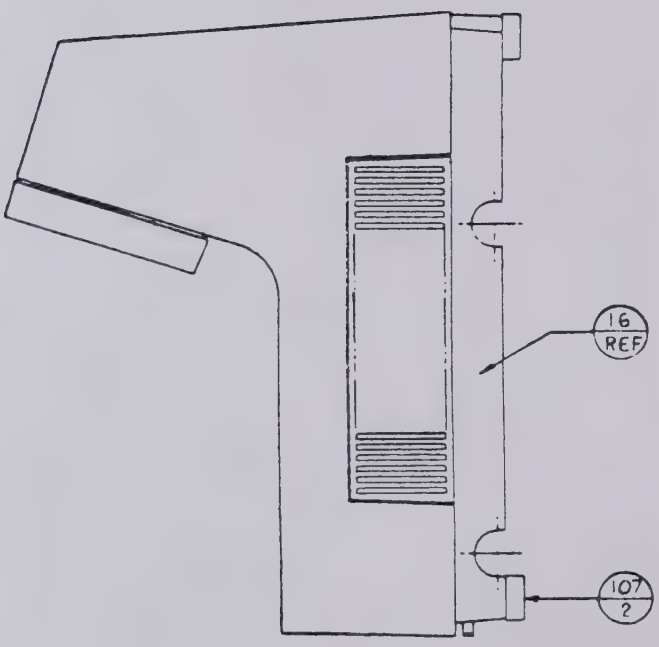


COVER ASSEMBLY
332242-170 REV. D

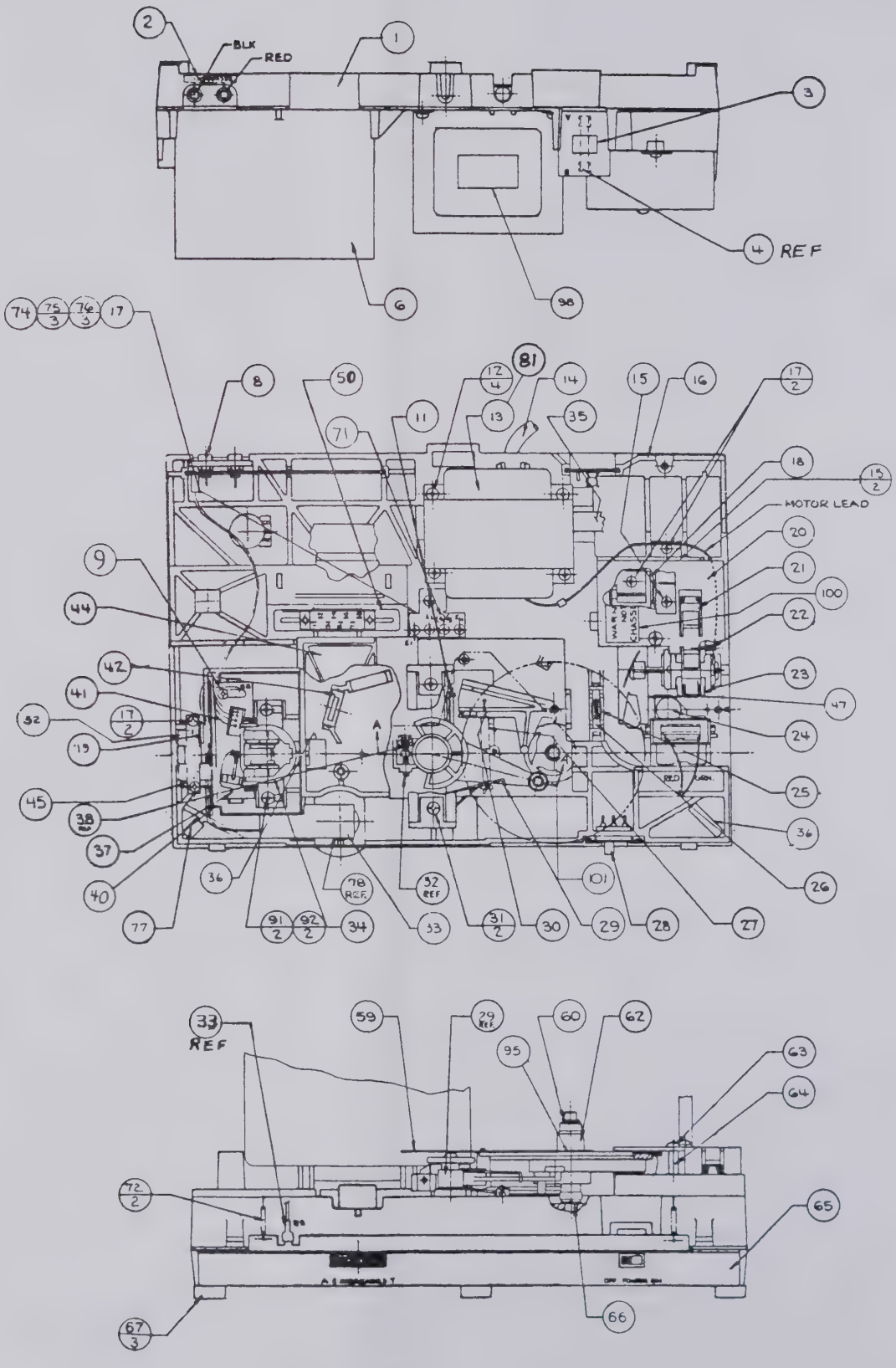
MODEL 332242 MAIN ASSEMBLY
332242-200, Rev. E

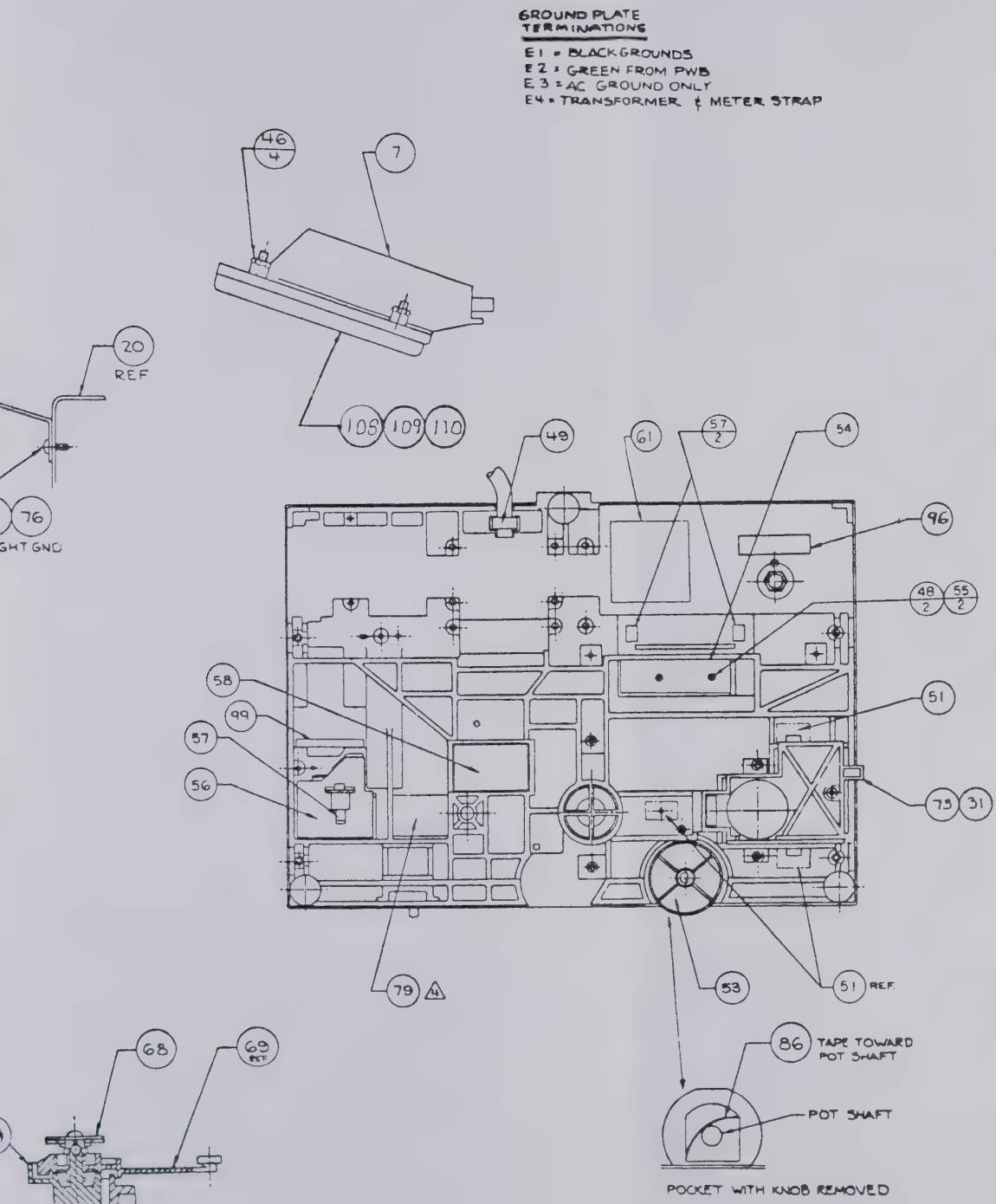
Item No.	Part No.	Description	Item No.	Part No.	Description
1	332225-156	Plate	56	332201-201	Plate
2	332201-309	Label	57	332201-202	Key
3	332201-122	Fuse Label	58	332201-180	Cover
4	332201-645	Fuse, 1.5A SB 250V	59	332201-283	Index Plate Assembly
5	371988-647	Connector, 2-Pin Molex 03-09-1023	60	332959-136	Truarc 5103-31MD
6	332201-6204	Power Board Assembly	61		
7	332225-152	Meter Mount	62	332201-158	Cam Assembly
8	332201-676	Output Jack Assembly	63	332201-245	Screw, Pan #8-32T x 2¾ Lg St.
9	333172-141	Screw, #6 x ¼ Self Tap, Pan 13	64	332201-207	Spacer
10	332225-162	Lamp Assembly	65	332225-117	Front Plate
11	332201-275	Entrance Slit	66	332201-312	Washer
12	333172-118	Screw, BT Pan Rec, #8 x ½ Lg. St.	67	332201-210	Foot
13	332202-651	Transformer Assembly	68	332201-329	Strap Assembly
14	332201-677	Power Cord Assembly	69		
15	332201-250	Screw, Pan A #6 x ¾ St.	70	332201-165	Ball, .1875 Dia. St.
16	332201-105	Base	71	343170-777	Ground Label
17	333172-119	Screw, #6 x ½ Lg BT St.	72	332201-260	Spring
18	332201-113	Sync Det. Assembly	73	332201-273	Base Cover Assembly
19	371966-111	Cable Clamp	74	332225-157	Ground Plate
20	332201-111	Heat Sink	75	344001-305	Screw, Pan #6-32 x ¼ Lg St.
21	332201-404	Motor Shield	76	332501-1181	Lock Washer, #6 Ext Tooth
22	332201-244	Pin, 9/64 Dia. Dowel 1 Lg.	77	332201-270	Pad
23	332201-644	Motor Assembly	78		
24	333307-6024	Power Board Assembly	79	332201-315	Plate
25	332201-028	Condenser Lens	80		
26	332201-224	Spring	81	332201-286	Insulator
27	332201-394	Spring	82		
28	332201-731	Switch Assembly	83	330000-777	Scotch Tape, Double Coated
29	332201-301	Spring, Torsion	84	332201-288	Grating Assembly
30	332201-146	Filter Mount Assembly	85	332225-1627	Cable Assembly
31	342501-473	Screw, Pan #8-32T x ⅜ Lg St	86	332201-300	Spring Assembly
32			87		
33	332225-6074	Potentiometer Board Assembly	88		
34	332201-152	Exit Slit Assembly	89		
35	332225-683	Flex Circuit Assembly	90		
36	332201-269	Pad	91	338640-190	Washer, #10
37	332201-393	Sensor Cover	92	334558-401	Screw, #8-32T x ½ Lg St.
38			93	333040-969	Sta-Strap Pand
39			94	335001-334	Inspector's Label
40	332201-203	Shroud	95	332201-267	Washer
41	332224-000	Sensor Assembly	96	332201-310	Label
42	332201-193	Mirror Mount Assembly	97	332239-000	Hinged Sample Compartment Cover Assembly
43					
44	332201-119	Monochromator Cover	98	332201-406	Label
45	332201-257	Spring	99	332225-273	Label
46	332979-233	Nut, Keps #6-32T	100	332201-135	Label
47	332201-368	Guard	101	333060-315	Truarc Gripring #5555-18
48	332201-144	Screw, #4-40T x ¼ Lg Nylon	102	371988-647	Connector Plug, 2-Pin 1543P1
49	332201-289	Ty-Rap	103	332242-170	Cover Assembly
50	332201-397	Switch Plate	104	332201-143	Screw, #10 x ½ Type B Pan, Rec.
51	332201-369	Black Photographic Tape	105	332242-121	Electrical Plate
52	332201-361	Light Seal	106	332242-110	Knob Assembly
53	332201-292	Knob Assembly	107	332201-112	Screw, 8-32T x 1½ St.
54	332201-410	Plate	108	330000-691	Scotch Tape, Single Coated
55	332201-411	Standoff	109	332959-234	Nut, Kep #10-32 Zinc St.
			110	333172-702	Meter


105
ACTIVATE WITH
104
103
WAVELENGTH
NANOMETERS
106



MAIN ASSEMBLY
332242-200 REV. E
SHEET 1 OF 2

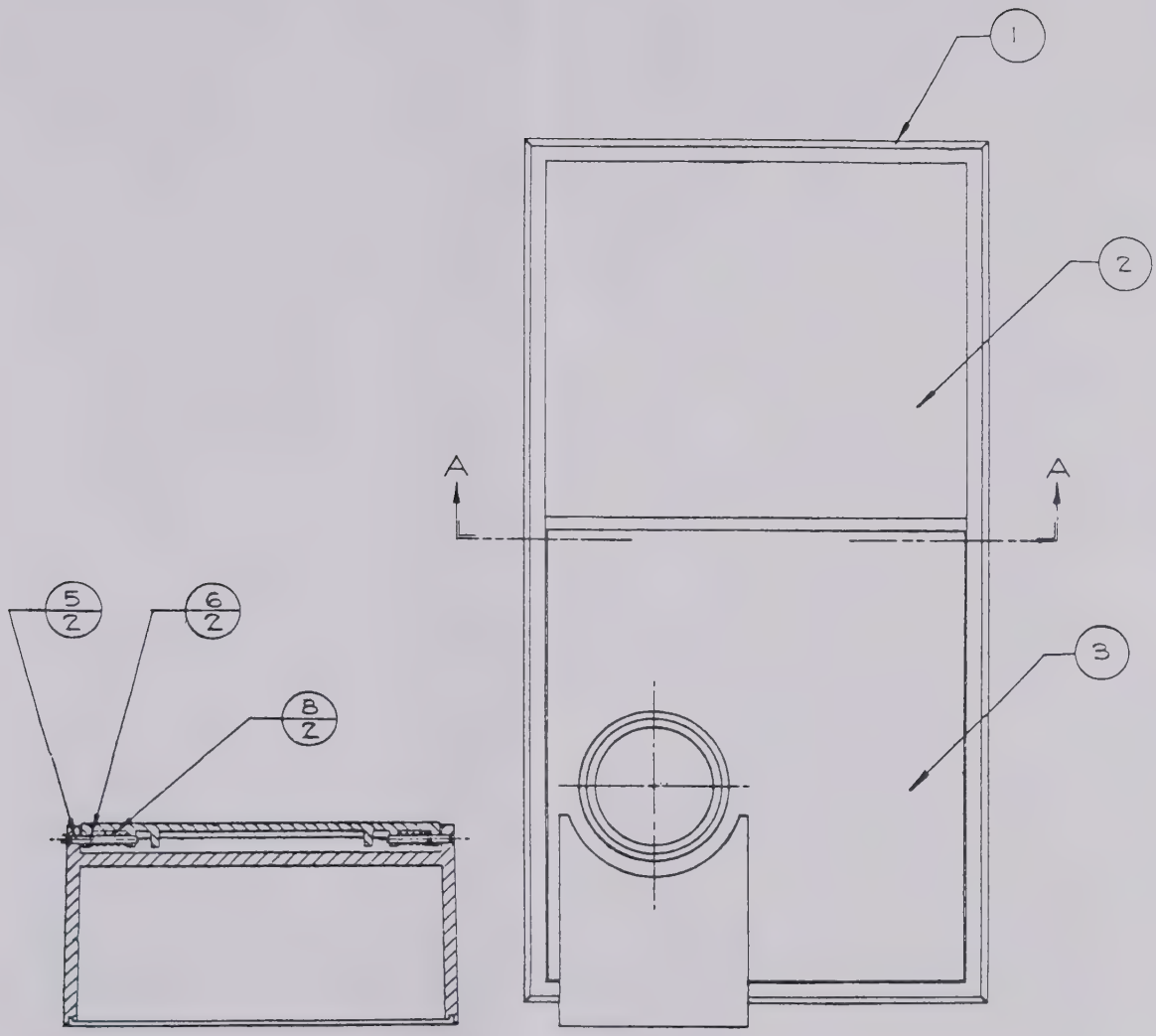

BLK
RED
MOTOR LEAD
PILO
33 REF



MAIN ASSEMBLY
332242-200 REV. E
SHEET 2 OF 2

GENERAL PURPOSE SAMPLE COMPARTMENT COVER ASSEMBLY 332244-135, Rev. D

Item No.	Part No.	Description
1	332244-103	Cover
2	332244-102	Face Plate
3	332244-104	Lid
4		
5	332230-119	Hinge Pin
6	332230-173	Truarc #5133-9
7		
8	332230-125	Spring, Lee #LC-016-139
	332225-152	Meter Mount



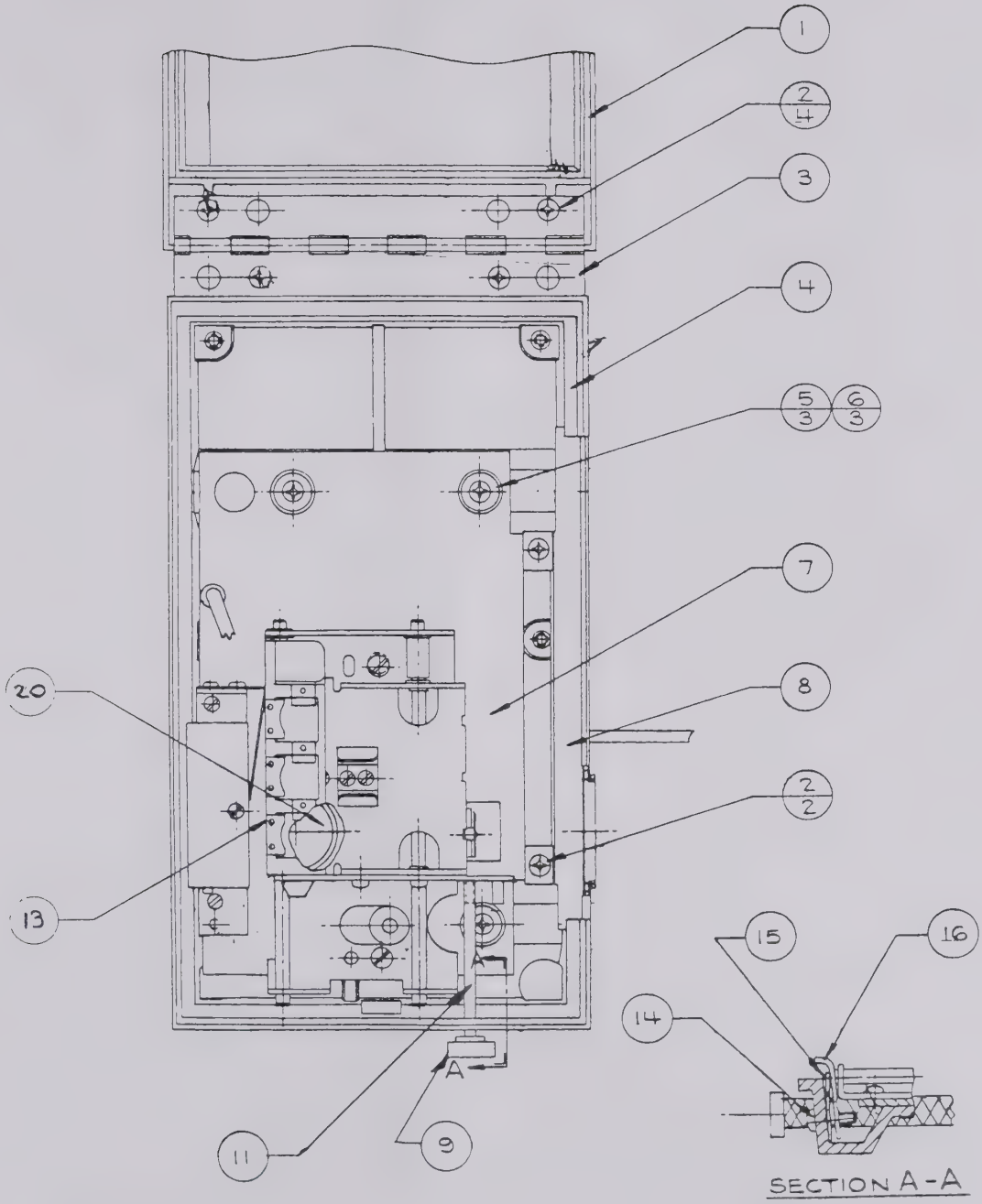
SECTION A-A

COVER ASSEMBLY

332244-135 REV. D

GENERAL PURPOSE SAMPLE COMPARTMENT MAIN ASSEMBLY 332244-200, Rev. C

Item No.	Part No.	Description
1	332244-135	Cover Assembly
2	333172-119	Screw, #6 x ½ Rec. Pan Hd
3	332225-203	Hinge
4	332230-160	Base
5	332230-120	Retainer
6	342501-473	Screw, #8-32 x ½ Rec. Pan Hd
7	332230-150	Stage Assembly
8	332230-161	Patch
9	332230-162	Thumbscrew Assembly
10	332221-200	GPSC Lens Assembly
11	332230-171	Actuator Handle
12	332230-148	Caplug, Black Plastic
13	332230-131	Holder Assembly
14	344001-186	Screw, #6-32 x ⅜ Rec. Pan Hd
15	332225-177	Latch Spring
16	332225-208	Latch
17	332244-101	Test Tube CVR
18	332244-855	Label
19	333172-196	Poly Bag 12 x 18
20	332230-126	Caplug #BPF-1
21	332244-10001	Manual GPSC
22	332959-317	Warranty Card S40-18



MAIN ASSEMBLY

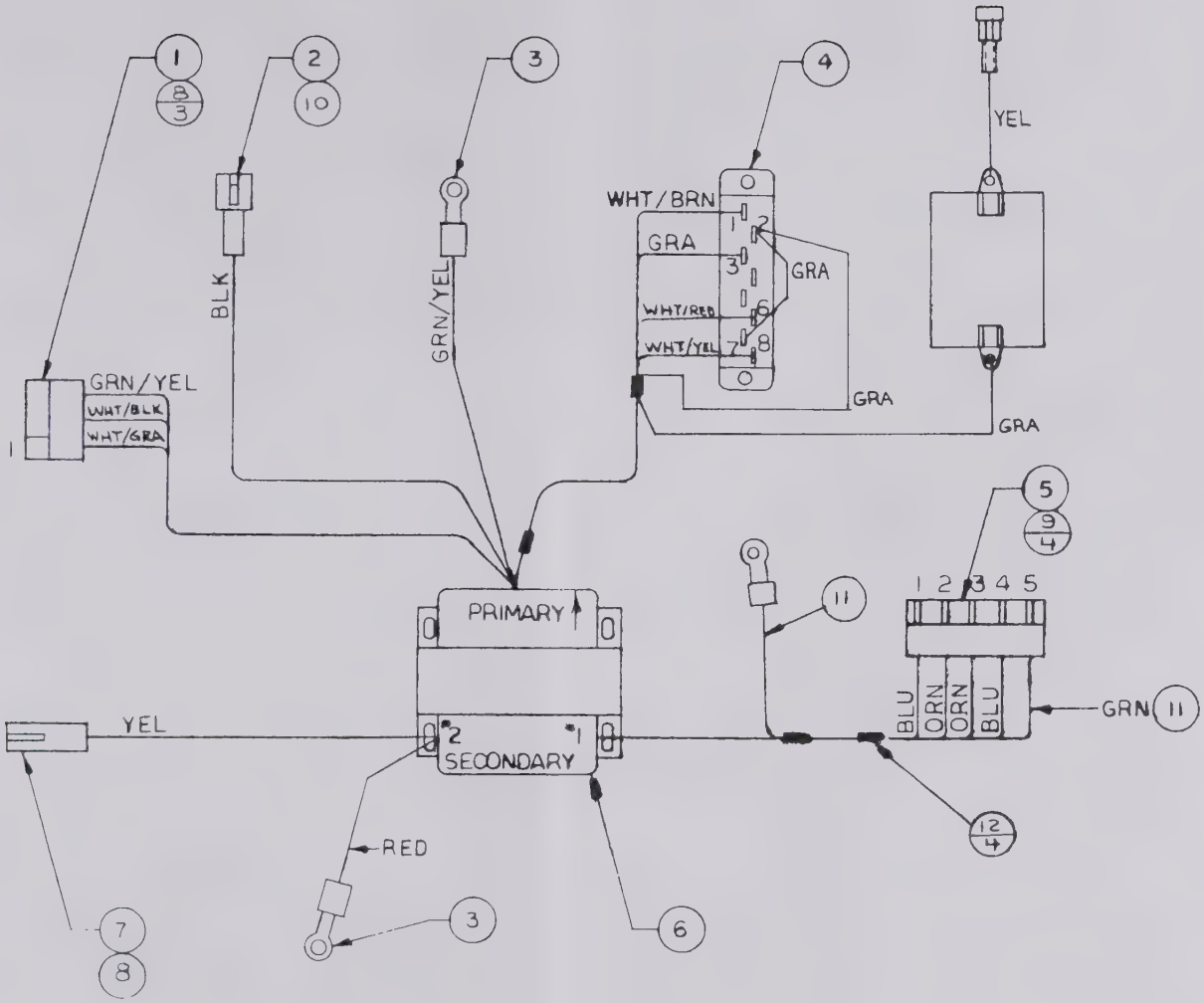
332244-200 REV. C

TAB B
TABLE OF CONTENTS

Title	Page
Transformer Assembly 332201-679	
Parts List	B-2
Drawing	B-3
Board and Bracket Assembly 332201-1073	
Parts List	B-4
Drawing	B-5
Cable Assembly 332201-1648	
Parts List	B-6
Drawing	B-7
Flex Circuit Assembly 332201-6074	
Parts List	B-8
Drawing	B-9
Display 3 Board Assembly 332201-6174	
Parts List	B-10
Drawing	B-11
Potentiometer Board Cable Assembly 332201-6184	
Parts List	B-12
Drawing	B-13
Model 332241 Cover Assembly 332241-170	
Parts List	B-16
Drawing	B-17
Model 332241 Main Assembly 332241-200	
Parts List	B-20
Drawing	B-21, 23

TRANSFORMER ASSEMBLY
332201-679, Rev. H

Item No.	Part No.	Description
1	332650-1302	Connector, Standard 3-Pin
2	332201-725	Connector, Recep. 1-Pin
3	333172-726	Ring Terminal, 22-18 #6 Screw
4	332201-6044	Fuse Board Assembly
5	332201-729	Connector Plug, 5-Pin
6	332201-1085	Transformer
7	332201-728	Connector Recep. 1-Pin
8	333083-658	Terminal, Molex 1381, Female 18-22 Crimp
9	332201-721	Terminal, Crimp 18-24
10	370302-765	Terminal, Molex 1380, Male 18-22 Crimp
11	332201-1628	Wire Assembly
12	333172-724	Ty-Rap TB TY903

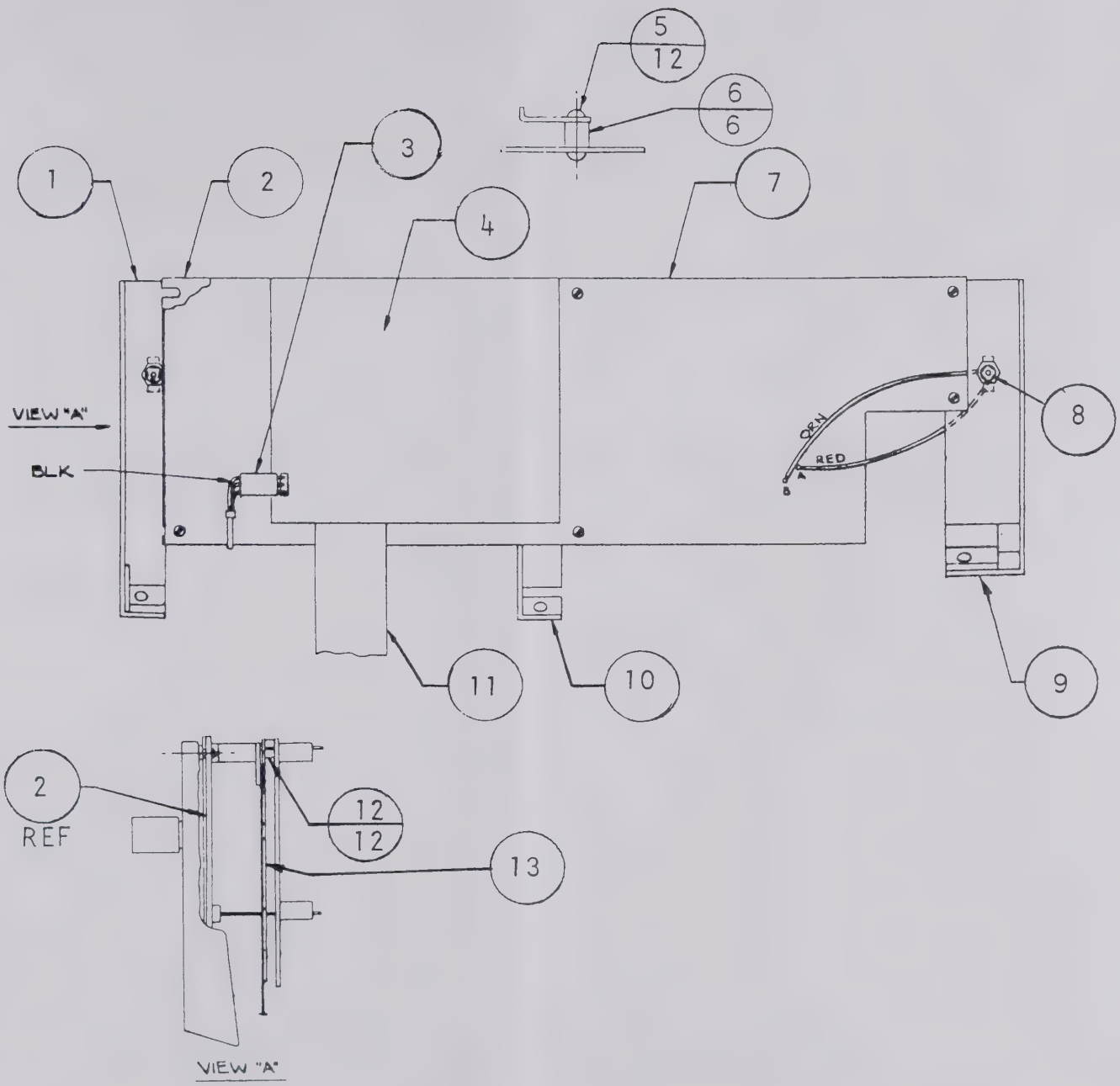


TRANSFORMER ASSEMBLY

332201-679 REV. H

BOARD AND BRACKET ASSEMBLY
332201-1073, Rev. D

Item No.	Part No.	Description
1	332201-390	Bracket, Power Board Lt
2	332201-346	Shield
3	332201-1645	Cable Assembly
4	332201-6174	Display 3 Assembly
5	387530-120	Screw, Pan 4-40 x 8/32 St
6	332230-151	Spacer, 3/8L 1/4 OD 4/40
7	332201-6094	DVM Power Board Assembly
8	332201-1639	Cable Harness
9	332201-389	Bracket, Power Board Rt
10	332201-242	Bracket
11	332201-1657	Cable Assembly
12	344002-218	Spacer, 3/16L 1/4 OD .115ID
13	332201-400	Insulator



BOARD & BRACKET ASSEMBLY

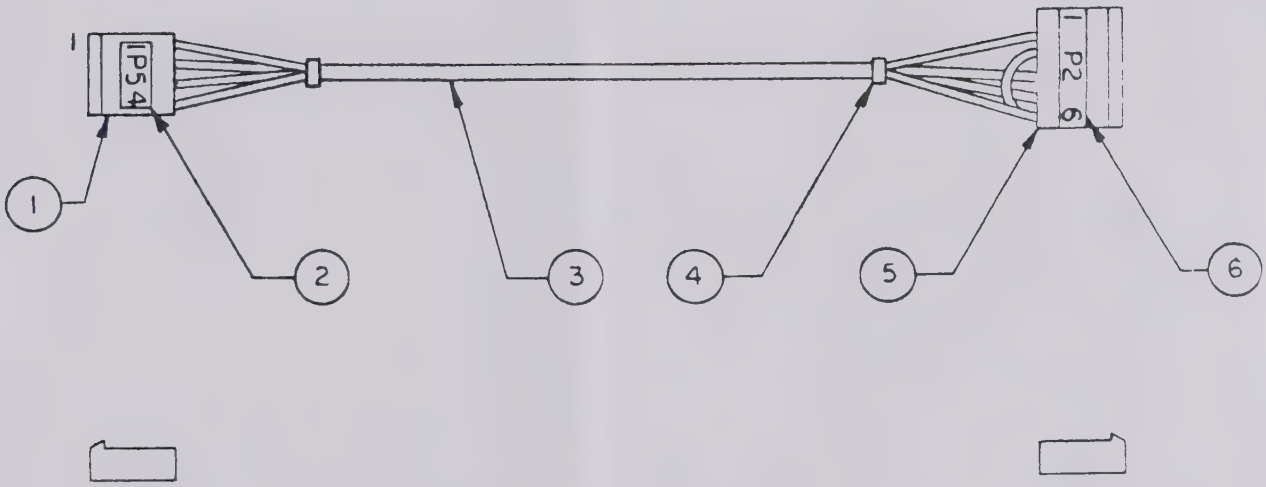
332201-1073 REV. D

CABLE ASSEMBLY
332201-1648, Rev. B

Item No.	Part No.	Description
1	344002-942	Connector, 4-Pin Molex #19-50-3041
2	332201-334	Label
3	332201-1646	Wire Assembly
4	333172-724	Ty-Rap TB TY903
5	344002-941	Connector, 6-Pin Molex #09-50-3061
6	332201-333	Label

PIN	COLOR
1	BRN
2	RED
3	ORN
4	YEL

PIN	COLOR
1	
2	RED
3	YEL
4	BRN
5	ORN
6	YEL

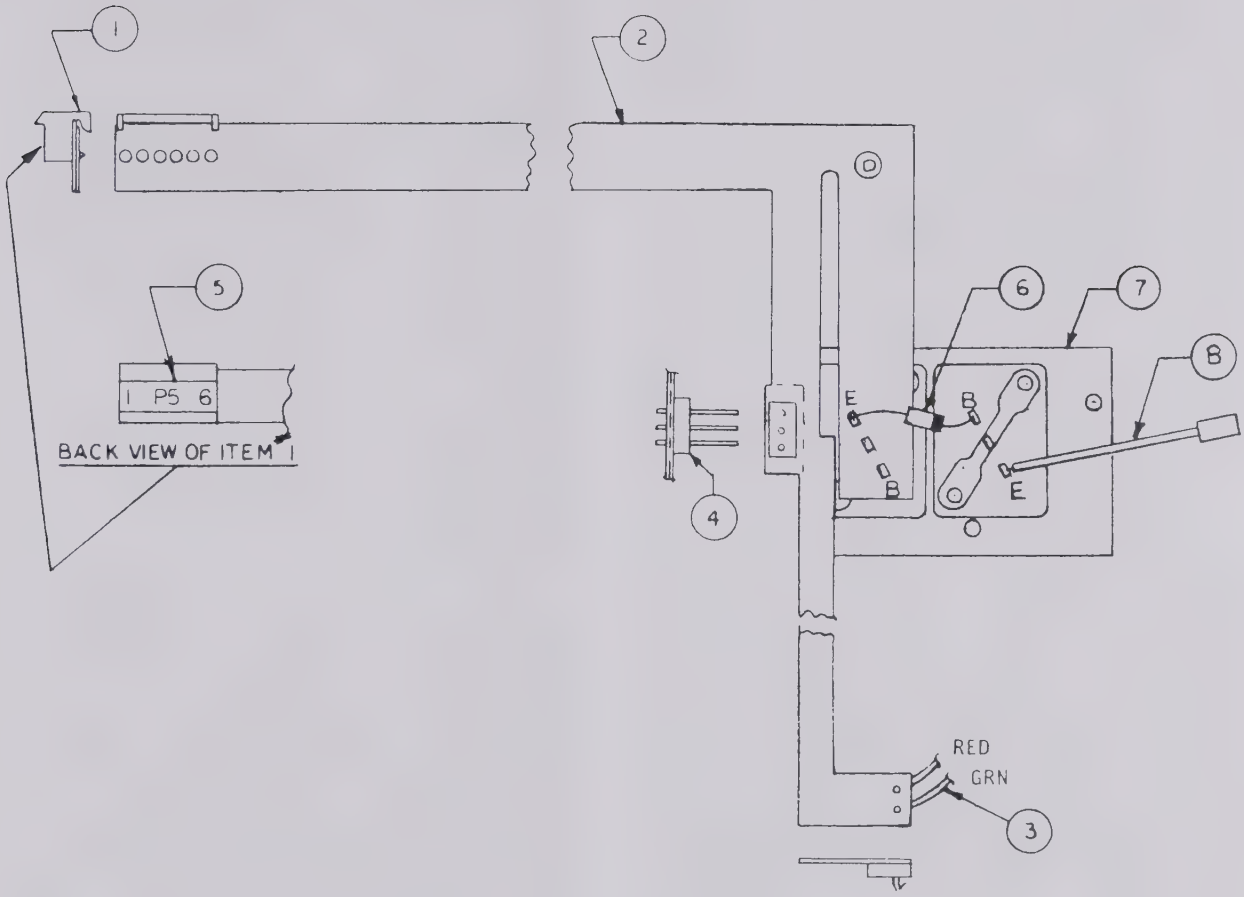


CABLE ASSEMBLY

332201-1648 REV. B

FLEX CIRCUIT ASSEMBLY
332201-6074, Rev. K

Item No.	Part No.	Description
1	344002-783	Connector, 6-Pin Molex #09-52-3061
2	332201-6073	Flex Circuit
3	332201-1622	Wire Assembly
4	332201-787	Wafer, 3-Pin Molex #09-64-1031
5	332201-332	Label
6	332755-139	Diode, IN914
7	332201-724	Heatsink Assembly
8	332201-1631	Wire Assembly

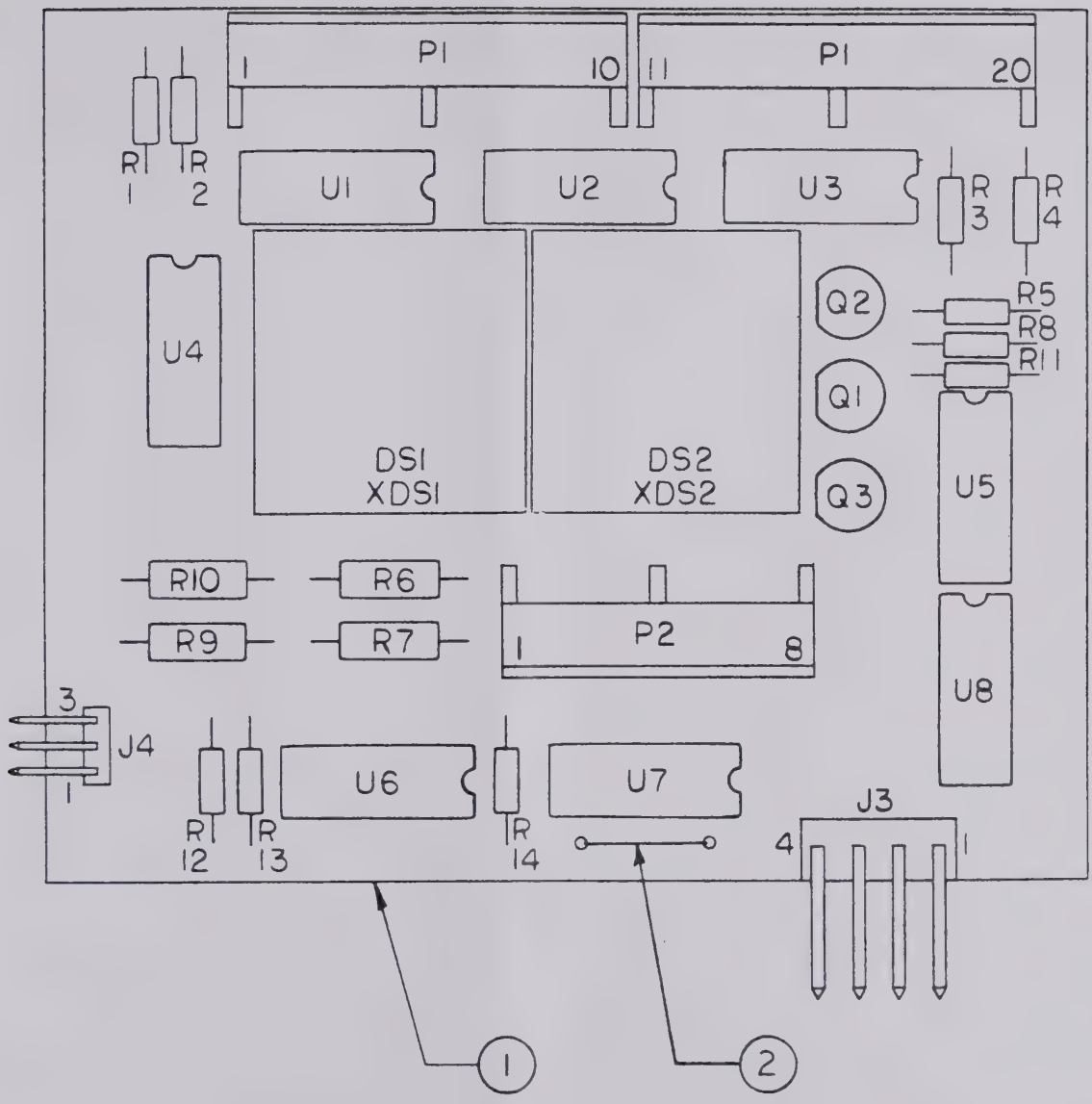


FLEX CIRCUIT ASSEMBLY

332201-6074 REV. K

DISPLAY 3 BOARD ASSEMBLY
332201-6174, Rev. D

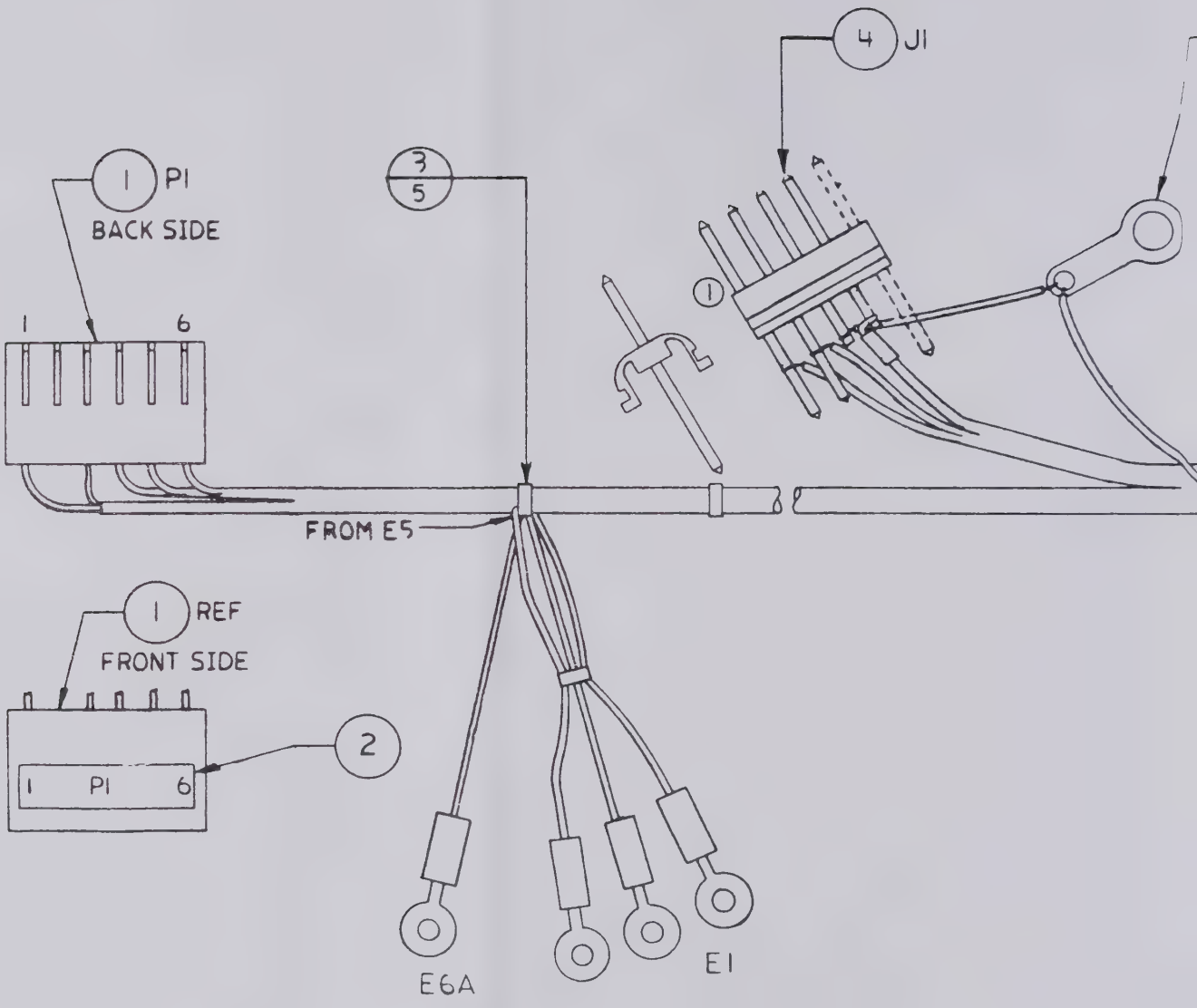
Item No.	Part No.	Description
1	332201-6173	Display 3 Board
2	330000-207	Wire 22 AWG Tinned
DS1	332201-1000	Display, Sperry SP-352
DS2	Same as DS1	
J3	332223-641	Wafer, 4 Pin, Rt. Ang. Molex #09-66-1041
J4	332201-1058	Wafer, 3 Pin, Rt. Ang. Molex #22-05-2031
P1	344002-748	Connector, 10-Pin Molex #09-52-3102
P2	332201-784	Connector, 8-Pin Molex #09-52-3082
Q1-Q3	333060-1166	Transistor, 2N5550
R1-R4	332201-735	Resistor, Comp. 11K 5% ¼W
R5	333060-670	Resistor, Comp. 18K 10% ¼W
R6, R7	332882-203	Resistor, Comp. 2.2K 10% ¼W
R8	Same as R5	
R9, R10	Same as R6	
R11	Same as R5	
R12, R13	342501-1495	Resistor, Comp. 1K 5% ¼W
R14	333060-885	Resistor, Comp. 10K 5% ¼W
U1-U4	332201-732	Decoder/Driver Sperry #00-700
U5	333501-660	Quad 2-Input Cos/Mos Nand Gate RCA #CD4011BEC
U6	332201-1074	Cos/Mos Hex Inverter RCA #CD4069BE
U7	335001-669	Cos/Mos Decade RCA #CD4017BE
U8	Same as U5	
XDS1	332201-799	Socket Sperry #CS-352
XDS2	Same as XDS1	

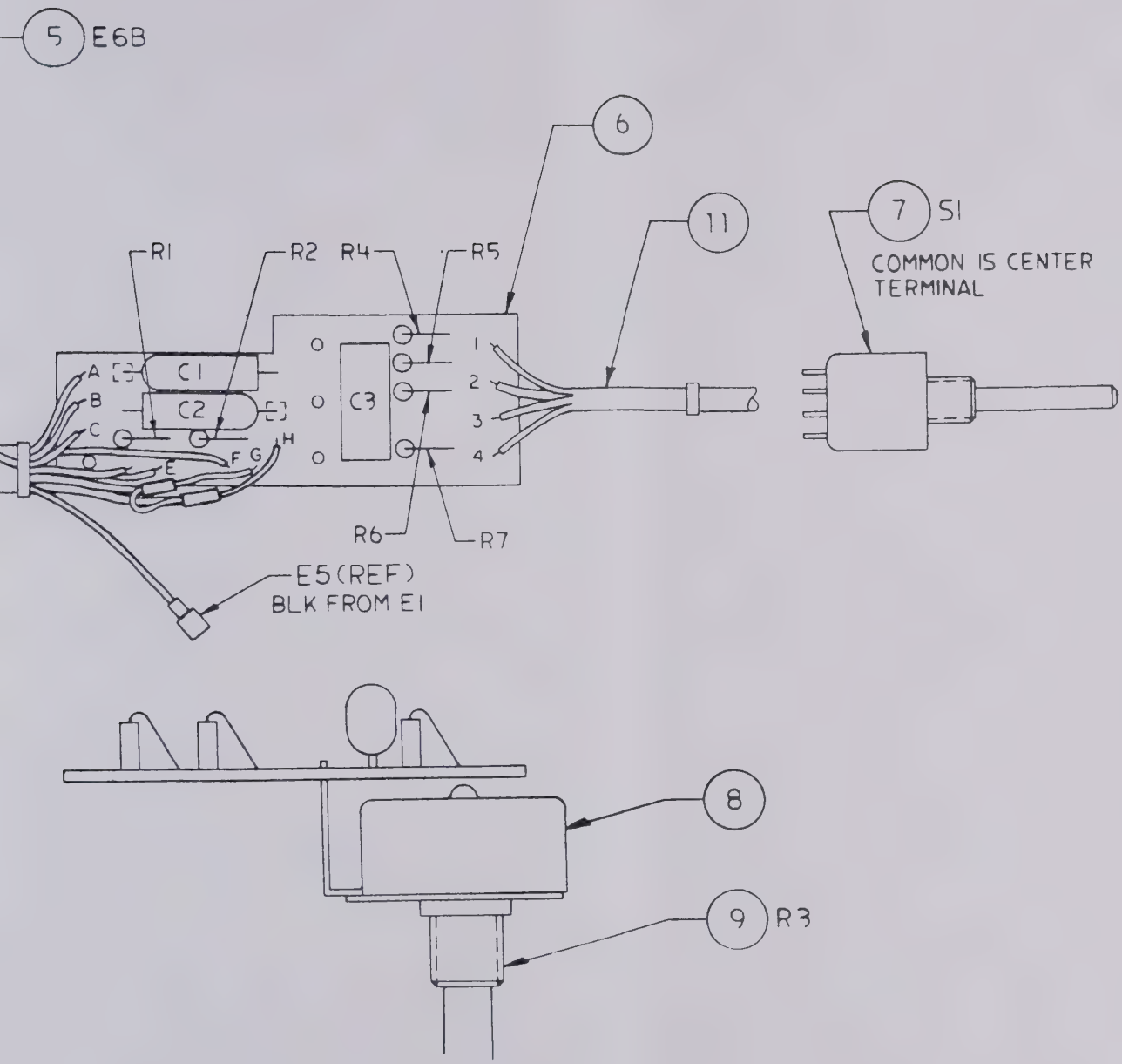


DISPLAY 3 BOARD ASSEMBLY
332201-6174 REV. D

POTENTIOMETER BOARD CABLE ASSEMBLY
332201-6184, Rev. G

Item No.	Part No.	Description
C1	371930-736	Capacitor, Tant, 10 MFD 20V
C2	Same as C1	
C3	332201-754	Capacitor, Film .15 MFD 100V
R1	342501-1495	Resistor, Carbon Film 1K 5% ¼W
R2	Same as R1	
R4	371957-666	Resistor, Carbon Film 4.7K 5% ¼W
R5	371951-683	Resistor, Carbon Film 15K 5% ¼W
R6	371956-648	Resistor, Carbon Film 82K 5% ¼W
R7	Same as R1	
1	332225-660	Connector, 6-Pin Molex #09-50-7061
2	332201-331	Label
3	333042-969	Sta-Strap, Panduit #SST1M
4	339090-757	Wafer, 5-Pin Molex #09-57-1050
5	343001-1806	Terminal, Locking #6 Screw
6	332201-6183	Potentiometer PC Board
7	332201-739	Switch, RCL Elect. #11-FCB-3PC
8	332201-271	Capacitor, Sinclair & Rush #.875-8
9	332201-738	Potentiometer
10	332225-1616	Wire Assembly
11	332201-1658	Wire Assembly
12	332225-1610	Wire Assembly

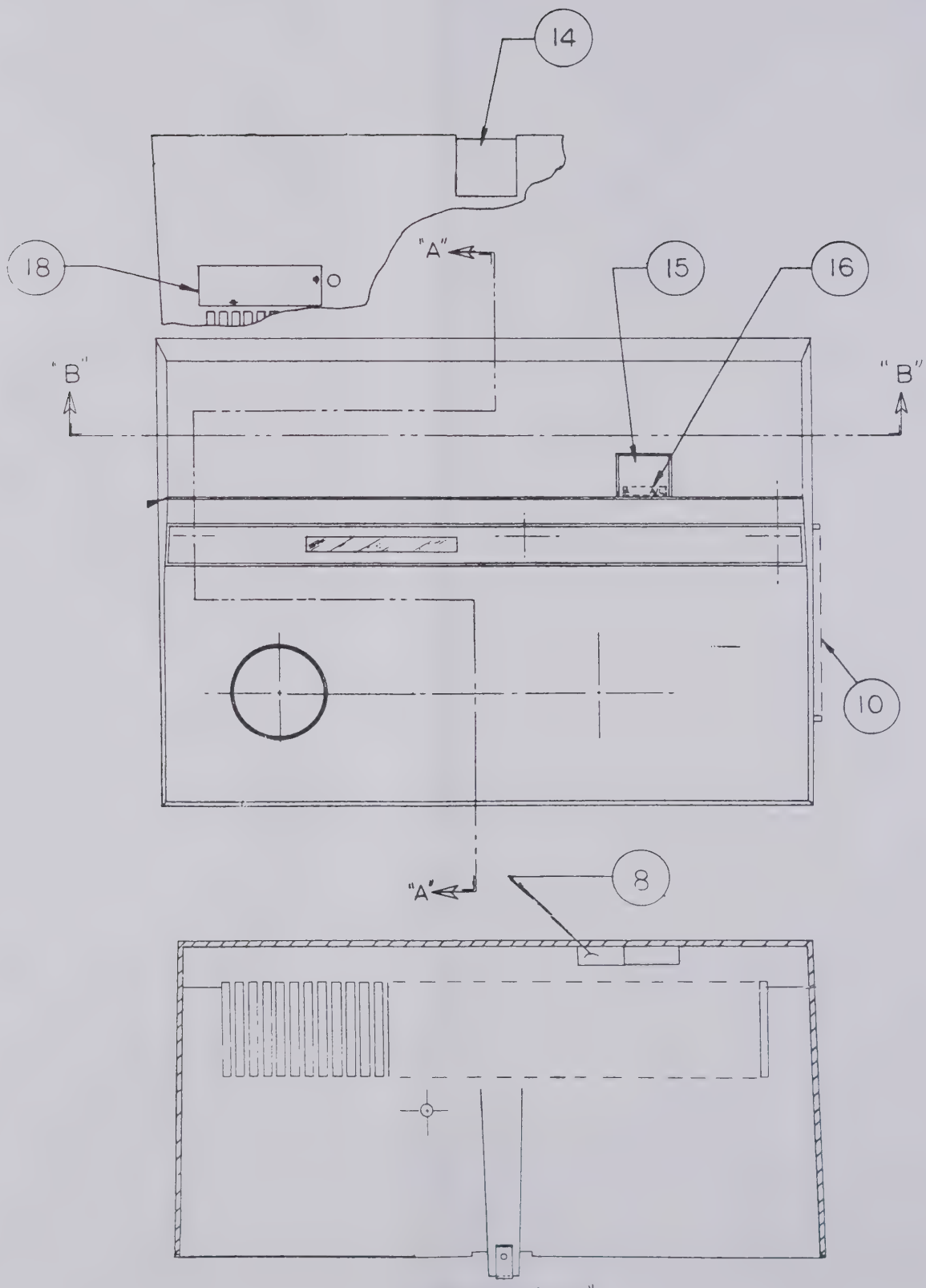

4
J1
1
P1
BACK SIDE
3
5
1
6
1
FROM E5
1
REF
FRONT SIDE
2
1
P1
6
E6A
E1



POT BOARD CABLE ASSEMBLY
332201-6184 REV. G

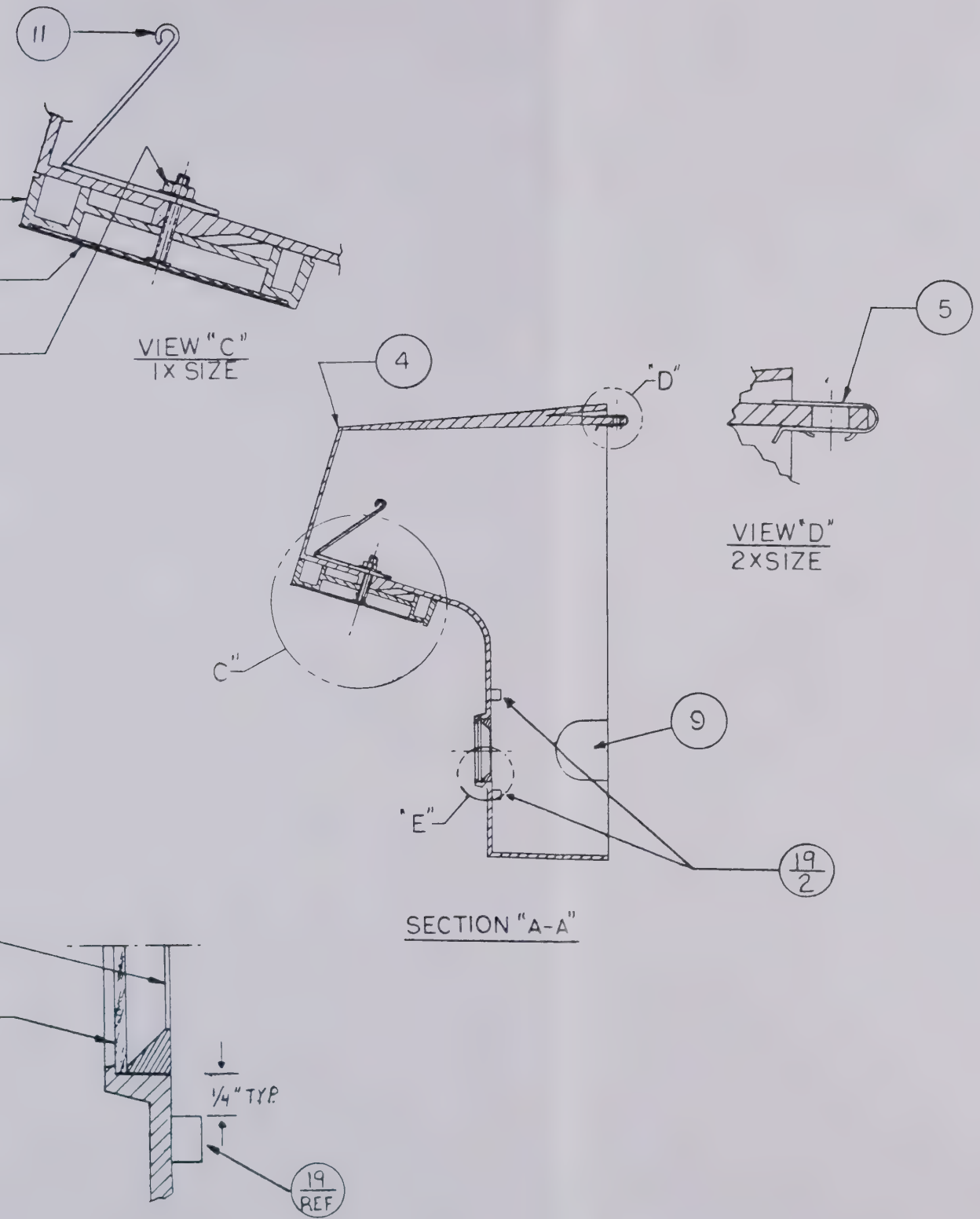
MODEL 332241 COVER ASSEMBLY
332241-170, Rev. D

Item No.	Part No.	Description
1	332201-235	Bezel
2	332241-102	Insert Assembly
3	332979-233	Nut, Keps 6-32T
4	332201-104002	Cover
5	332201-268	Nut, Tin Utype C6438-8Z
6	332201-142	Retainer
7	332201-138	Window
8	332201-266	Pad
9	332201-184	Plug, Round
10	332201-107	Door
11	332201-325	Ground Strap
12		
13		
14	332201-366	Label
15	332201-241	Plug, Square
16	332201-307	Label
17		
18	332201-347	Label
19	330000-105	Foam Tape



SECTION "B-B"

332201-10020

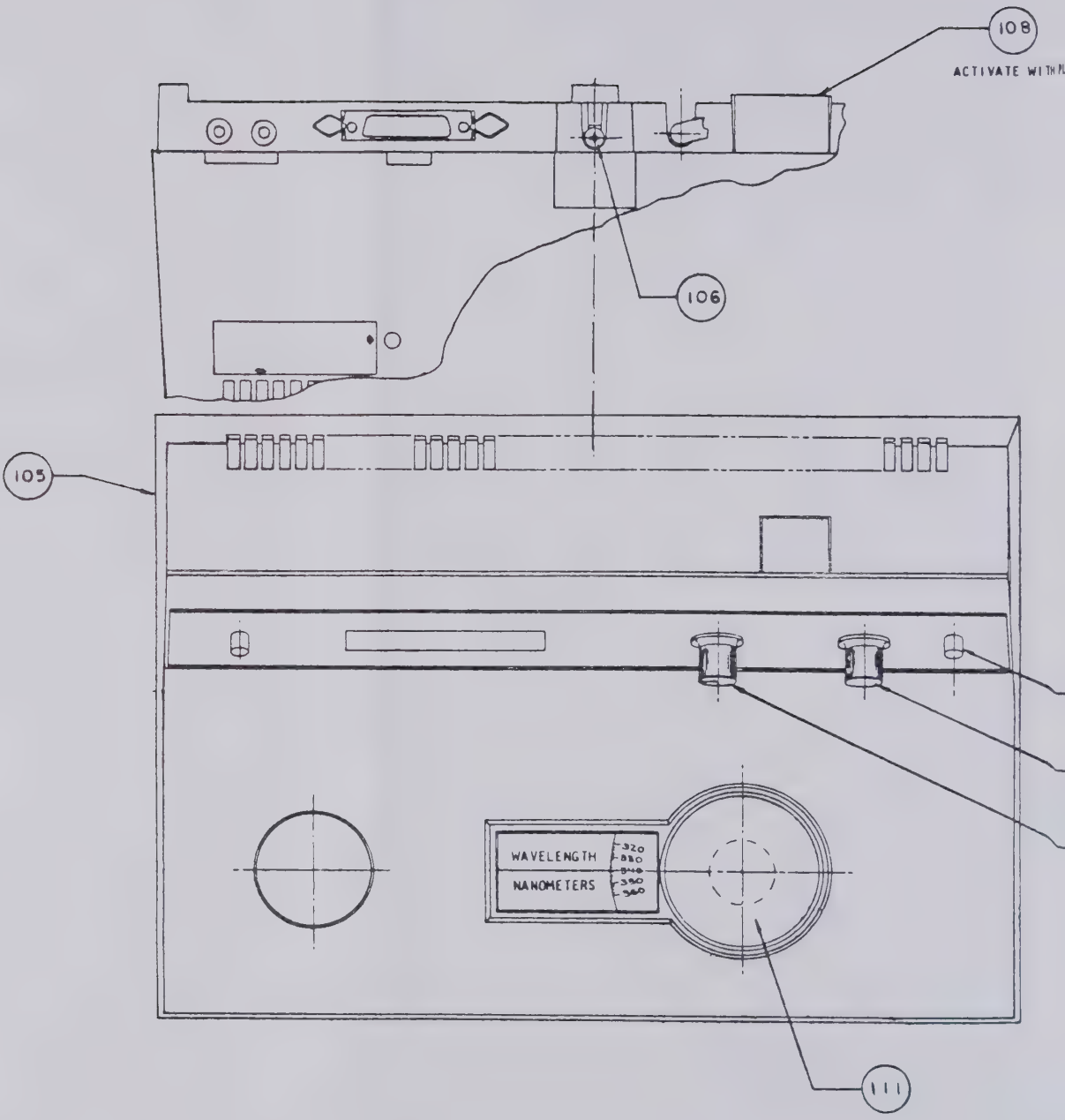


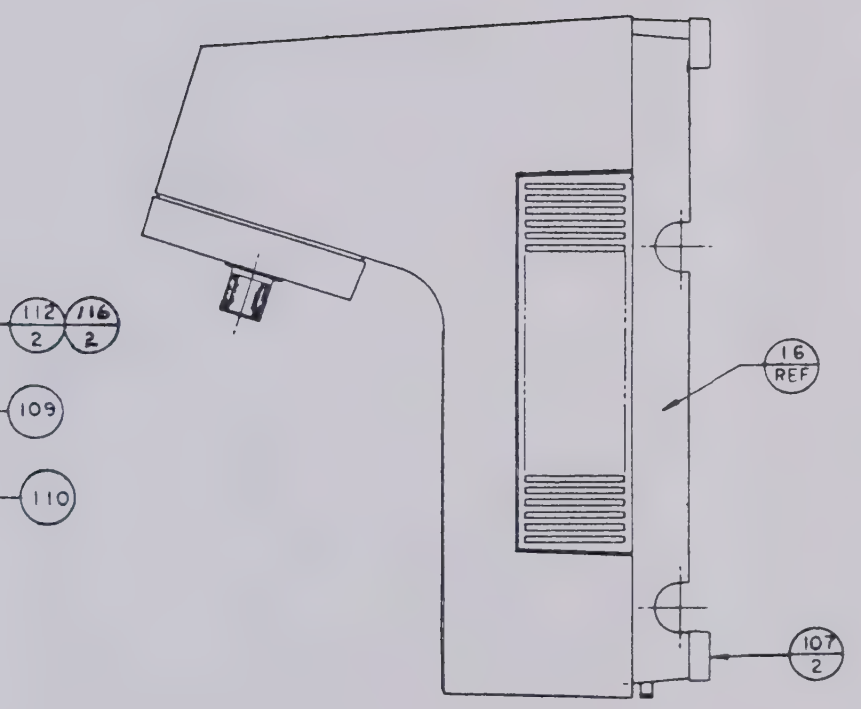
COVER ASSEMBLY

332241-170 REV. D

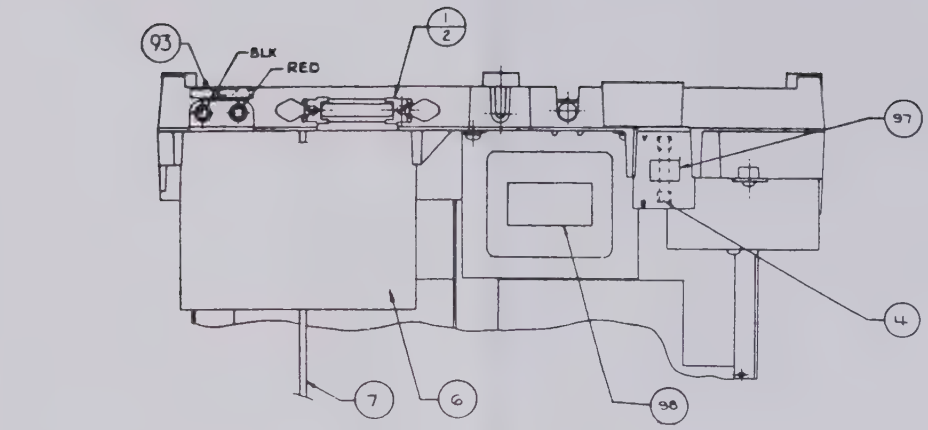
MODEL 332241 MAIN ASSEMBLY
332241-200, Rev. E

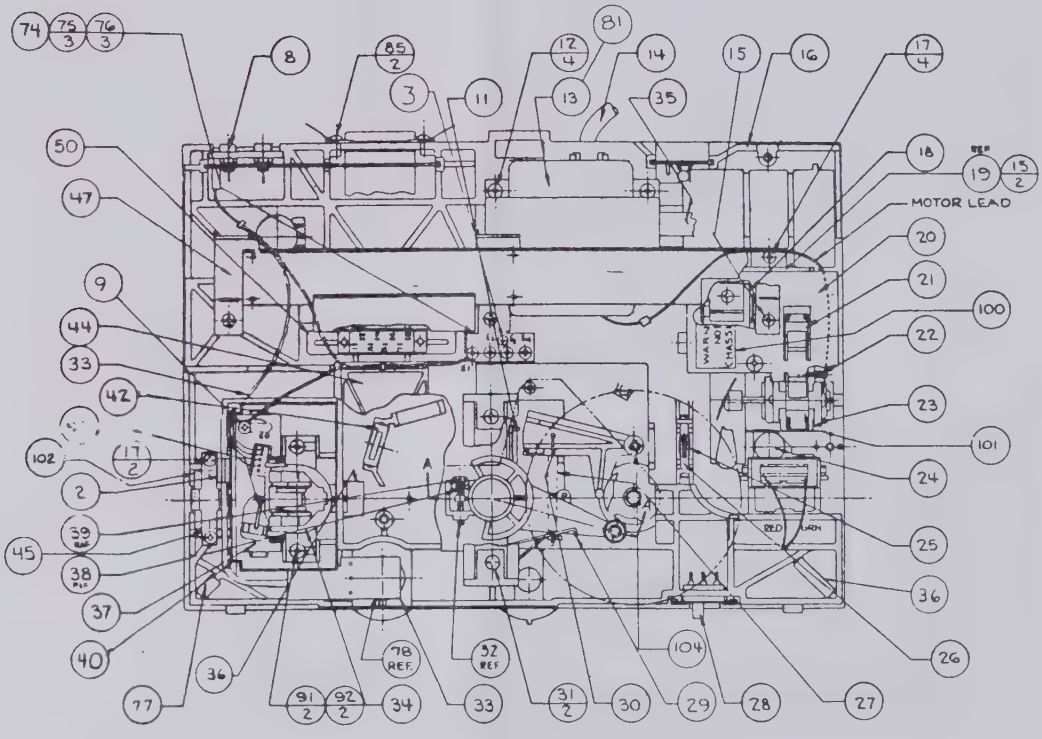
Item No.	Part No.	Description	Item No.	Part No.	Description
1	332201-344	Latch and Spring Assembly	59	332201-283	Index Plate Assembly
2	371966-111	Cable Clamp	60	332959-136	Truarc 5103-31 MD
3	343170-777	Ground Label	61		
4	332201-645	Fuse, 1.5A SB 250V	62	332201-158	Cam Assembly
5	371988-646	Connector, 2-Pin Molex 03-09-1021	63	332201-245	Screw, Pan #8-32T x 2¾ Lg St.
6	332201-6204	Power Board Assembly	64	332201-207	Spacer
7	332201-1648	Cable Assembly	65	332201-227	Front Plate
8	332201-676	Output Jack Assembly	66	332201-312	Washer
9	333172-141	Screw, #6 x ¼ Self-Tap	67	332201-210	Foot
10			68	332201-329	Strap Assembly
11	332201-275	Entrance Slit	69		
12	333172-118	Screw, #8 Self-Tap	70	332201-165	Ball, Stainless .1875 Dia.
13	332201-679	Transformer Assembly	71		
14	332201-677	Power Cord Assembly	72	332201-260	Spring
15	332201-250	Screw, Pan #6 x ¾ Lg. St.	73	332201-273	Base Cover Assembly
16	332201-105	Base	74	332225-157	Ground Plate
17	333172-119	Screw, BT #6 x ½ Lg. Pan St.	75	344001-305	Screw, Pan #6-32T x ¼ St.
18	332201-113	Sync Det. Assembly	76	332501-1181	Lock Washer, #6 Ext Tooth
19	332201-724	Heat Sink Assembly	77		
20	332201-111	Heat Sink	78	332201-271	Cap
21	332201-404	Motor Shield	79	332201-315	Plate
22	332201-244	Pin, Dowel 1406 Dia.	80		
23	332201-644	Motor Assembly	81	332201-286	Insulator
24	333307-000	Lamp Board Assembly	82	371988-647	Plug, Molex #1543P1
25	332201-028	Condenser Lens	83		
26	332201-224	Spring	84	332201-288	Grating Assembly
27	332201-394	Spring	85	344001-699	Screw, #4 Self-Tap ⅜ Lg.
28	332201-731	Switch Assembly	86	332201-300	Spring Assembly
29	332201-301	Spring, Torsion	87		
30	332201-146	Filter Mount Assembly	88		
31	342501-473	Screw, Pan #8-32 x ⅜ Lg St	89		
32			90		
33	332201-6184	Potentiometer Board Assembly	91	338640-190	Washer #10
34	332201-152	Sample Compartment and Slit Assembly	92	334558-401	Screw, #8-32 x ½ Lg.
35	332201-6074	Flex Circuit Assembly	93	332201-309	Label
36	332201-269	Pad	94		
37	332201-393	Sensor Cover	95	332201-267	Washer
38			96	332201-310	Label
39	332201-285	Groov-Pin 3/64 Dia. X	97	332201-122	Fuse Label
40	332201-203	Shroud	98	332201-406	Label
41	332224-000	Sensor Assembly	99	332225-273	Label
42	332201-193	Mirror Mount Assembly	100	332201-135	Label
43			101	332201-368	Guard
44	332201-119	Mono Cover	102	332201-361	Light Seal
45	332201-257	Spring	103		
46	387592-133	Label, FCC	104	333060-315	Truarc Grip Ring #5555-18
47	332201-1073	Board and Bracket Assembly	105	332241-170	Cover Assembly
48	332201-144	Screw, #4-40 x ¼ Lg. Nylon	106	332201-143	Screw, #10 x ½ Type B
49	332201-289	Ty-Rap	107	332201-112	Screw, #8-32T x 1½ St.
50	332201-397	Switch Plate	108	332241-121	Electrical Plate
51	332201-410	Plate	109	332241-116	Knob Assembly
52	332201-411	Standoff	110	332241-115	Knob Assembly
53	332201-292	Knob Assembly	111	332241-110	Knob Assembly
54	332201-291	Knob Assembly	112	332201-278	Extension
55			113	333040-969	Sta-Strap Pand
56	332201-201	Plate	114	335001-334	Inspector Label
57	332201-202	Key	115	332239-000	Hinged Sample Compartment Cover Assembly
58	332201-180	Cover, Base Hole	116	332201-314	Button, Black

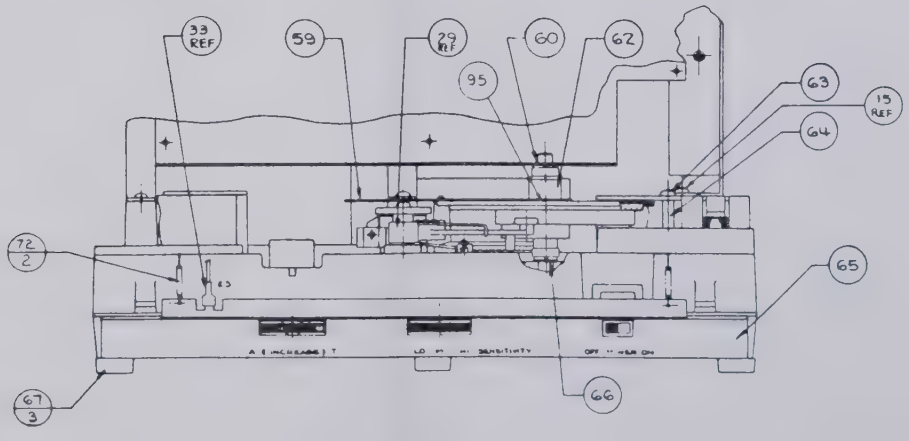

108
ACTIVATE WITH
106
105
WAVELENGTH
NANOMETERS
320
880
340
360
111



MAIN ASSEMBLY
332241-200 REV. E
SHEET 1 OF 2


93
BLK
RED
1/2
97
4
7
6
98

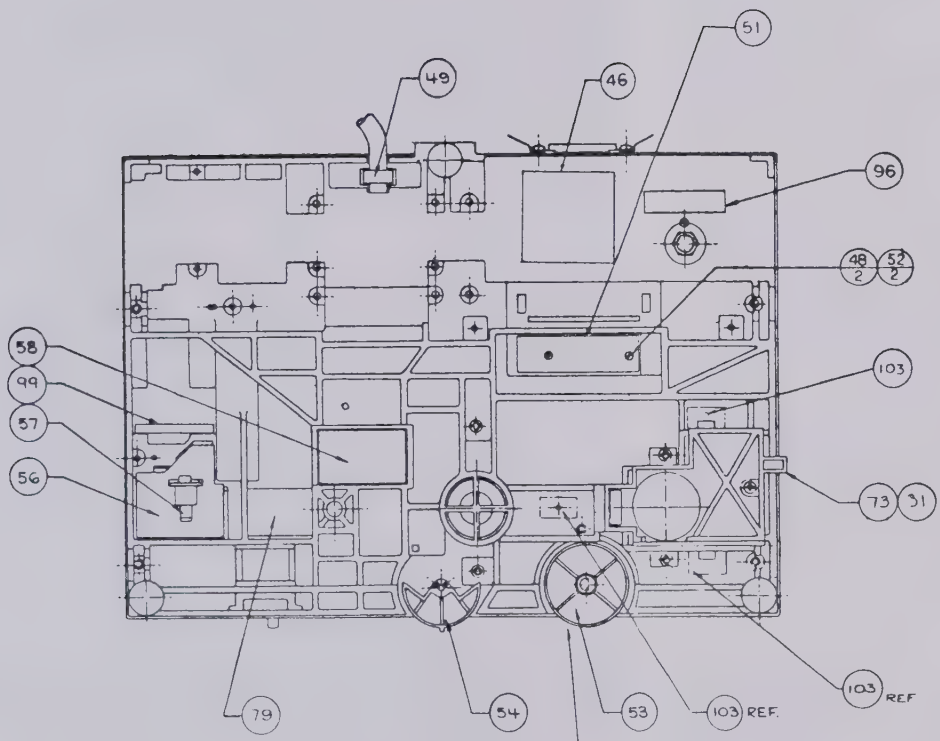

74
75/3
76/3
8
85/2
3
11
12/4
13
81
14
35
15
16
17/4
18
19
15/2
MOTOR LEAD
20
21
100
22
23
101
24
25
36
26
50
47
9
44
33
42
102
17/2
2
39 REF
45
38 PLT
37
40
77
36
78 REF
32 REF
104
91/2
92/2
34
33
31/2
30
29
28
27

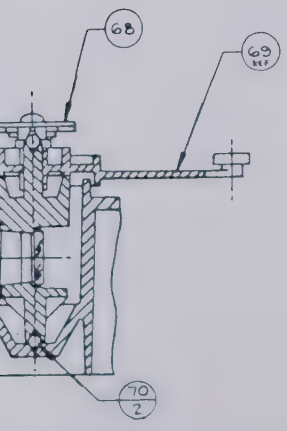

33 REF
59
29 REF
60
62
95
63
15 REF
64
72/2
65
67/3
66

84
71 REF

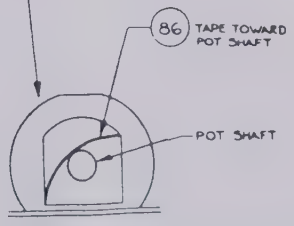
GROUND PLATE TERMINATIONS

E1 = BLACK GROUNDS
E2 = GREEN FROM PWB
E3 = AC GROUND ONLY
E4 = TRANSFORMER





IAL SECTION A-A



POCKET WITH KNOB REMOVED

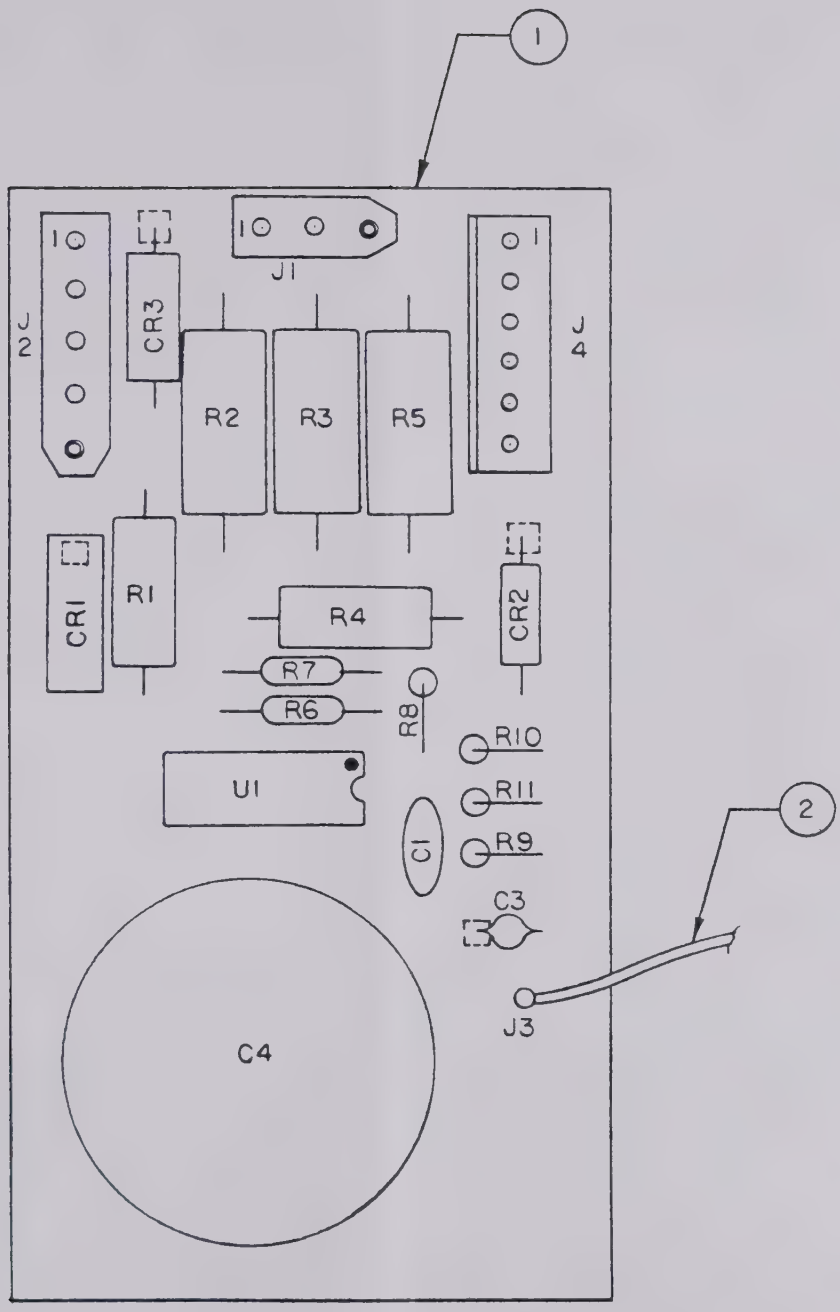
MAIN ASSEMBLY
332241-200 REV. E
SHEET 2 OF 2

TAB C
TABLE OF CONTENTS

Title	Page
UV Power Supply Board Assembly 332225-6114	
Parts List	C-2
Drawing	C-3
Schematic 332225-60004	C-5
Transformer Assembly 332226-641	
Parts List	C-8
Drawing	C-9
Model 332243 Cover Assembly 332243-170	
Parts List	C-10
Drawing	C-11
Model 332243 Main Assembly 332243-200	
Parts List	C-14
Drawing	C-15, 17
Lamphouse Assembly 332243-250	
Parts List	C-20
Drawing	C-21

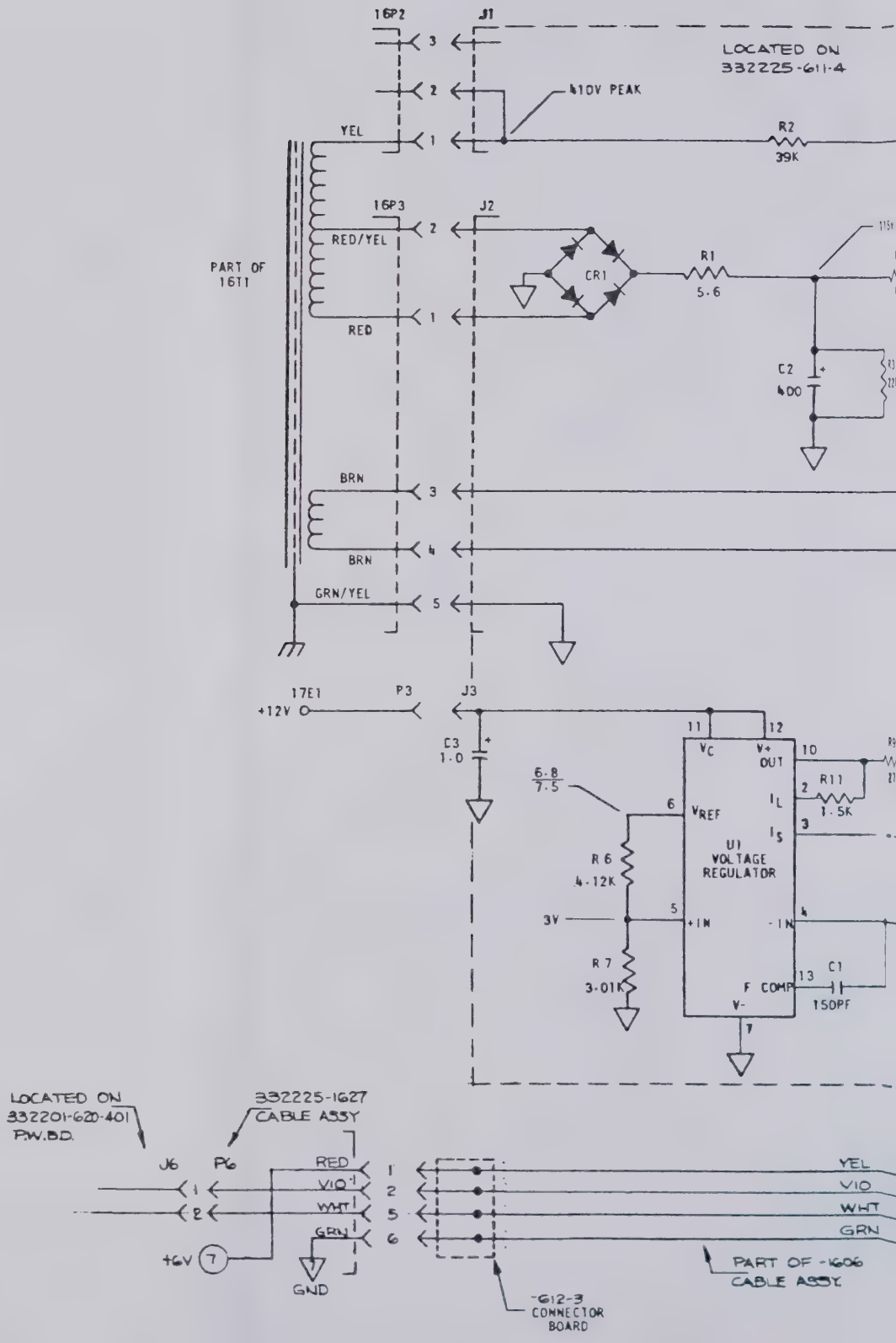
UV POWER SUPPLY BOARD ASSEMBLY
332225-6114, Rev. L

Item No.	Part No.	Description
C1	N333060-1061	Capacitor, Disc Ceramic 150PF ± 10% RMC Type JG
C4	A332225-650	Capacitor, Electrolytic 400 MFD 200V Mallory Type PFP
CR1	S332225-651	Bridge Rectifier, M DA 102-A
CR2	S342501-684	Diode F4
CR3	S333172-762	Diode
J1	N344001-716	Wafer, 3-Pin, Molex 1840-3
J2	N333083-740	Wafer, 5-Pin, Molex 1840-5
J3	N333070-748	Terminal Amp #60599-1
J4	A332225-646	Wafer, 6-Pin, Molex 09-60-1061
R1	S333225-647	Resistor, Comp, 5.6 0HMS 10% 1W
R2	S332881-342	Resistor, Comp, 39K 10% 2W
R3	S332881-347	Resistor, Comp, 22K 10% 2W
R4	S332225-648	Resistor, Comp, 6.8 0HMS 10% 2W
R5	S332225-649	Resistor, Comp, 1 0HM 10% 2W
R6	S344001-876	Resistor, Comp, RN 60, 4.12K 1% ¼W
R7	S344001-867	Resistor, Comp, RN 60, 3.01K 1% ¼W
R8	S371955-647	Resistor, Comp, 1.8K 5% ¼W
R9	S371951-659	Resistor, Comp, 27 0HMS 5% ¼W
R10	Same as R8	
U1	S332201-1053	Precision Voltage Regulator, Fairchild UA723DC or Silicon General #SG723CN
1	C332225-6113	UV Power Supply Board
2	B332225-1613	Wire Assembly
C3	S333097-642	Capacitor, Tant 1 MFD ± 10% 20V Kemet T362
R11	S371957-650	Resistor, 1.5K ± 5% ¼W



POWER SUPPLY BOARD ASSEMBLY

332225-6114 REV. G

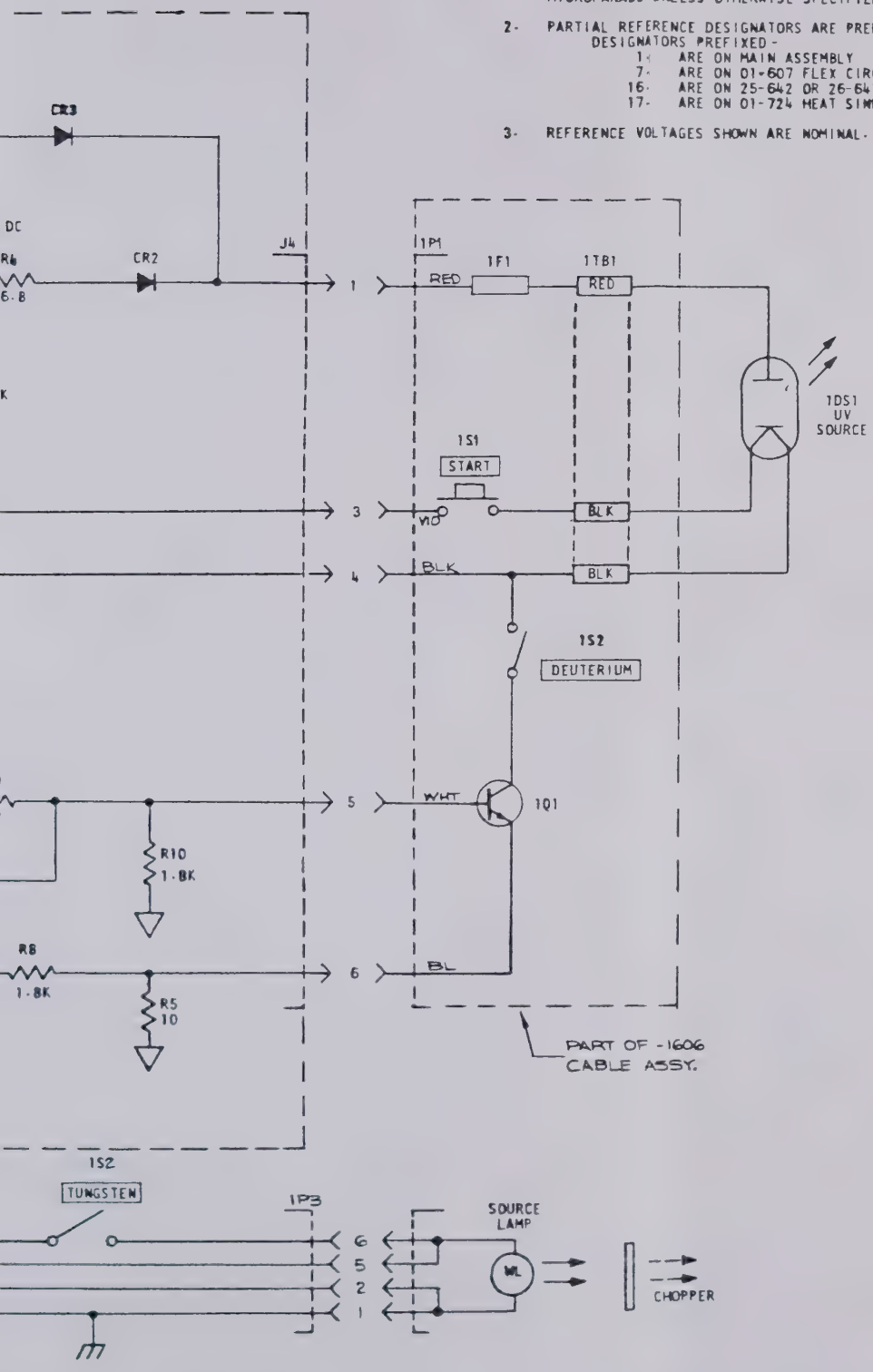

16P2
J1
LOCATED ON
332225-611-4
3
2
±10V PEAK
YEL
1
R2
39K
16P3
J2
2
RED/YEL
PART OF
16T1
CR1
R1
5.6
1
RED
C2
400
BRN
3
BRN
4
GRN/YEL
5
17E1
+12V
P3
J3
C3
1.0
11
12
VC
V+
OUT
10
6.8
7.5
R11
1.5K
2
IL
6
VREF
3
IS
U1
VOLTAGE
REGULATOR
R6
4.12K
3V
5
+IN
-IN
4
R7
3.01K
13
C1
F COMP
150PF
V-
7
LOCATED ON
332201-620-401
P.W.BD.
332225-1627
CABLE ASSY
J6
P6
RED
1
VIO
2
WHT
5
GRN
6
1
2
+6V
7
GND
YEL
VIO
WHT
GRN
PART OF -1606
CABLE ASSY.
-612-3
CONNECTOR
BOARD

NOTES

1. RESISTANCE VALUES IN OHMS. CAPACITANCE VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

2. PARTIAL REFERENCE DESIGNATORS ARE PREFIX 2 ON -602 PWB DESIGNATORS PREFIXED -
   1- ARE ON MAIN ASSEMBLY
   7- ARE ON 01-607 FLEX CIRCUIT
   16- ARE ON 25-642 OR 26-641 TRANSFORMER ASS'Y
   17- ARE ON 01-724 HEAT SINK ASSEMBLY

3. REFERENCE VOLTAGES SHOWN ARE NOMINAL.

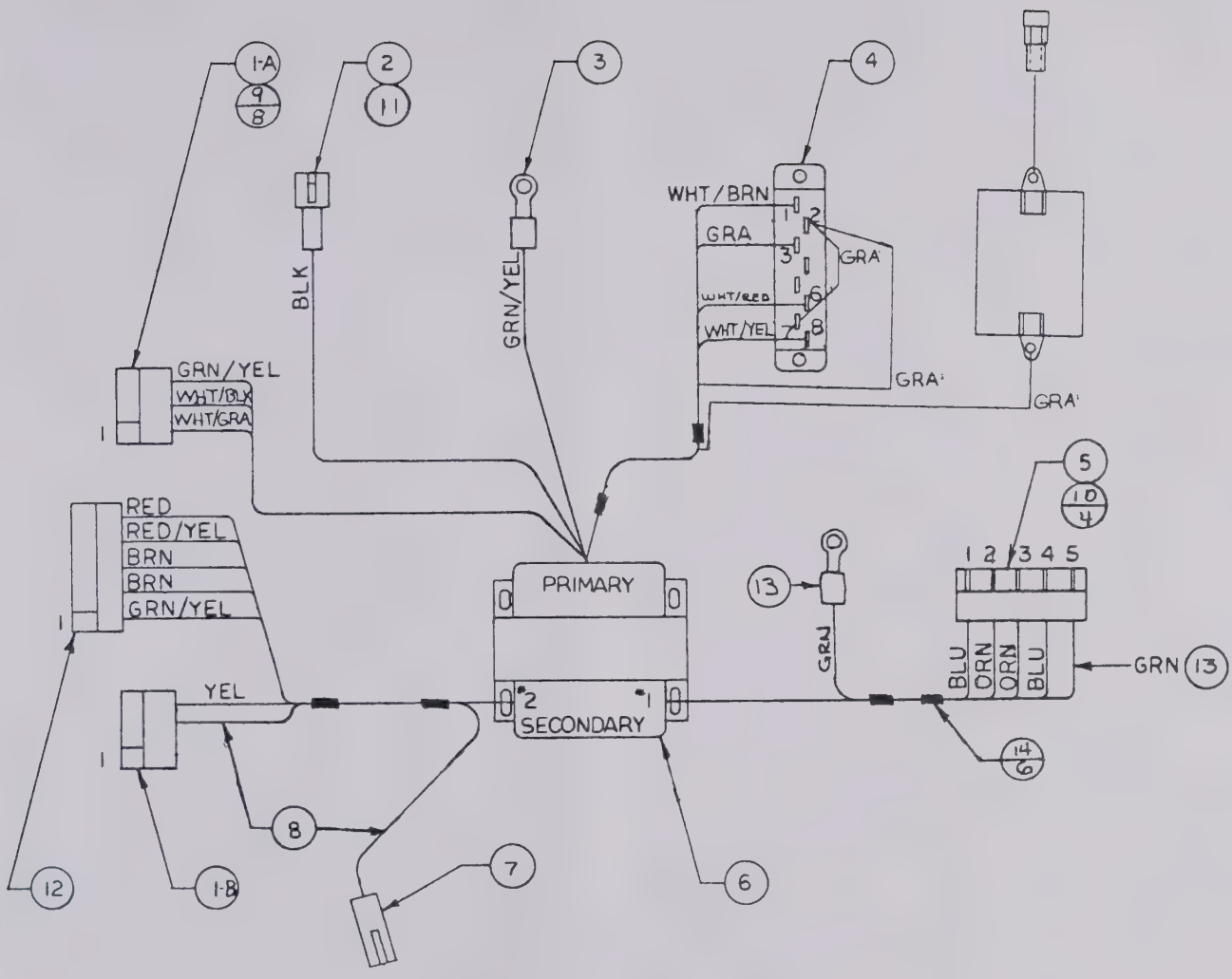


UV POWER SUPPLY SCHEMATIC

332225-60004 REV. D

TRANSFORMER ASSEMBLY
332226-641, Rev. G

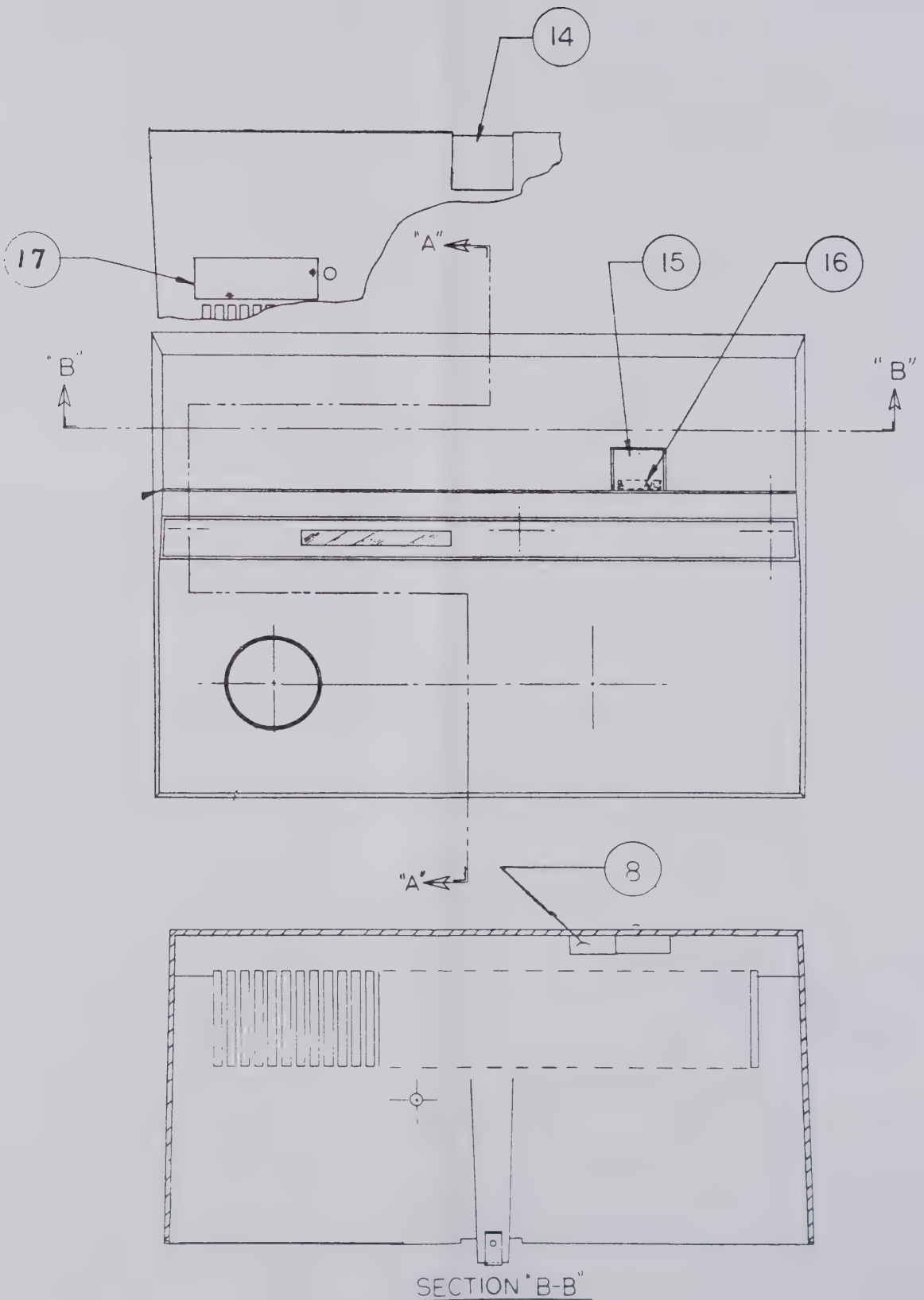
Item No.	Part No.	Description
1	332650-1302	Connector, Molex 1396R-1 3 Pin
2	332201-725	Connector, Recep 1 Pin
3	333172-726	Ring Terminal, 22-18 #6 Screw
4	332201-6044	Fuse Board Assembly
5	332201-729	Connector, Plug 5-Pin
6	332225-699	Transformer
7	332201-728	Connector, Receptacle 1 Pin
8	332226-1601	Wire Assembly
9	333083-658	Terminal, Molex 1381 Female 18-22 Crimp
10	332201-721	Terminal, Crimp 18-24
11	370302-765	Terminal, Molex 1380 Male 18-22 Crimp
12	333083-741	Terminal, Molex 1653R-1 Male 1653R-1
13	332201-1628	Wire Assembly
14	333172-724	Ty-Rap

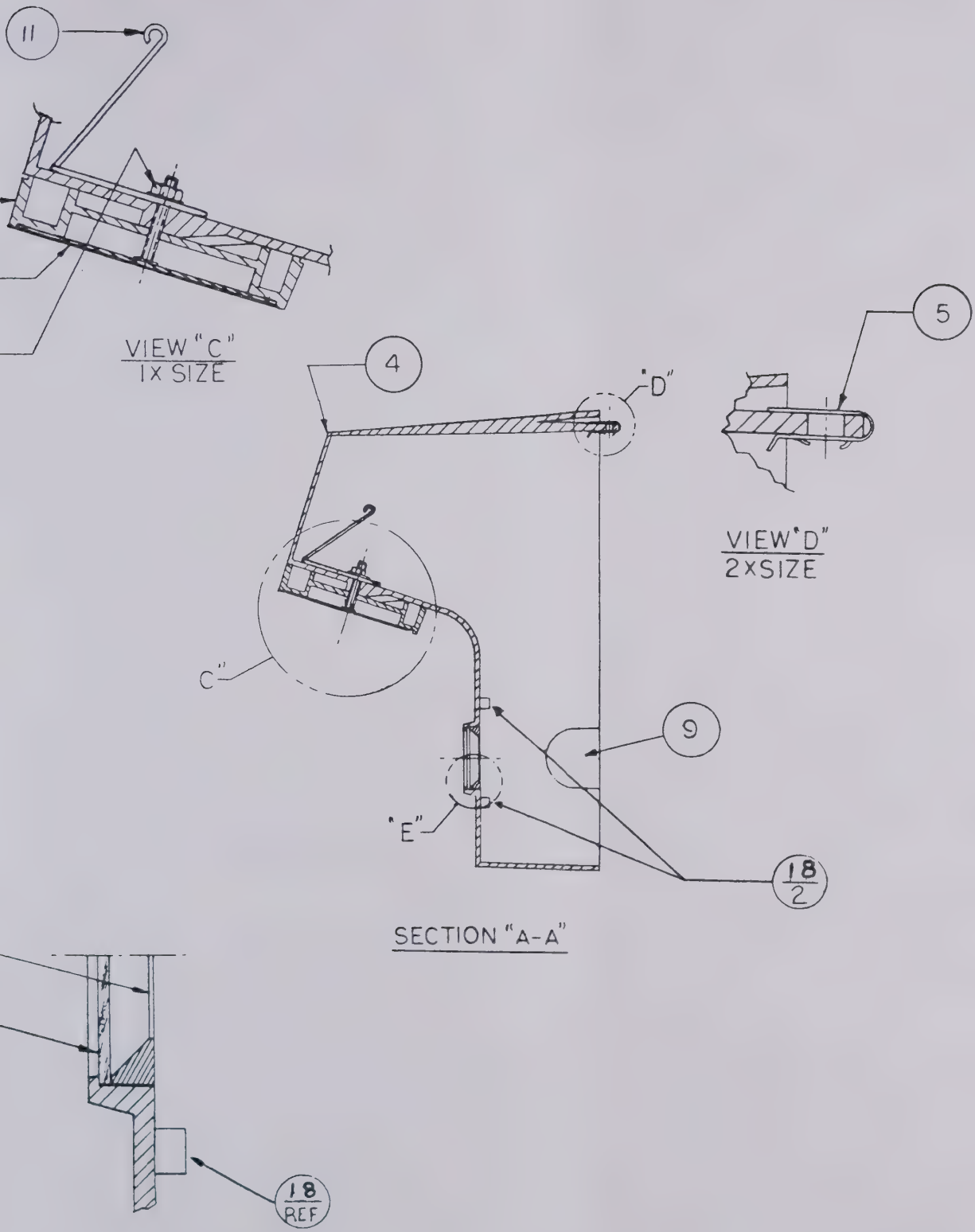


TRANSFORMER ASSEMBLY
332226-641 REV. G

MODEL 332243 COVER ASSEMBLY
332243-170, Rev. D

Item No.	Part No.	Description
1	332201-235	Bezel
2	332241-102	Insert Assembly
3	332979-233	Nut, Keps 6-32T
4	332201-104	Cover
5	332201-268	Nut, Tin Utype C6438-8Z
6	332201-142	Retainer
7	332201-138	Window
8	332201-266	Pad
9	332201-184	Plug, Round
11	332201-325	Ground Strap
14	332201-366	Label
15	332201-241	Plug, Square
16	332201-307	Label
17	332201-347	Label
18	330000-105	Foam Tape


14
17
"A"
15
16
"B"
"B"
"A"
8
SECTION "B-B"

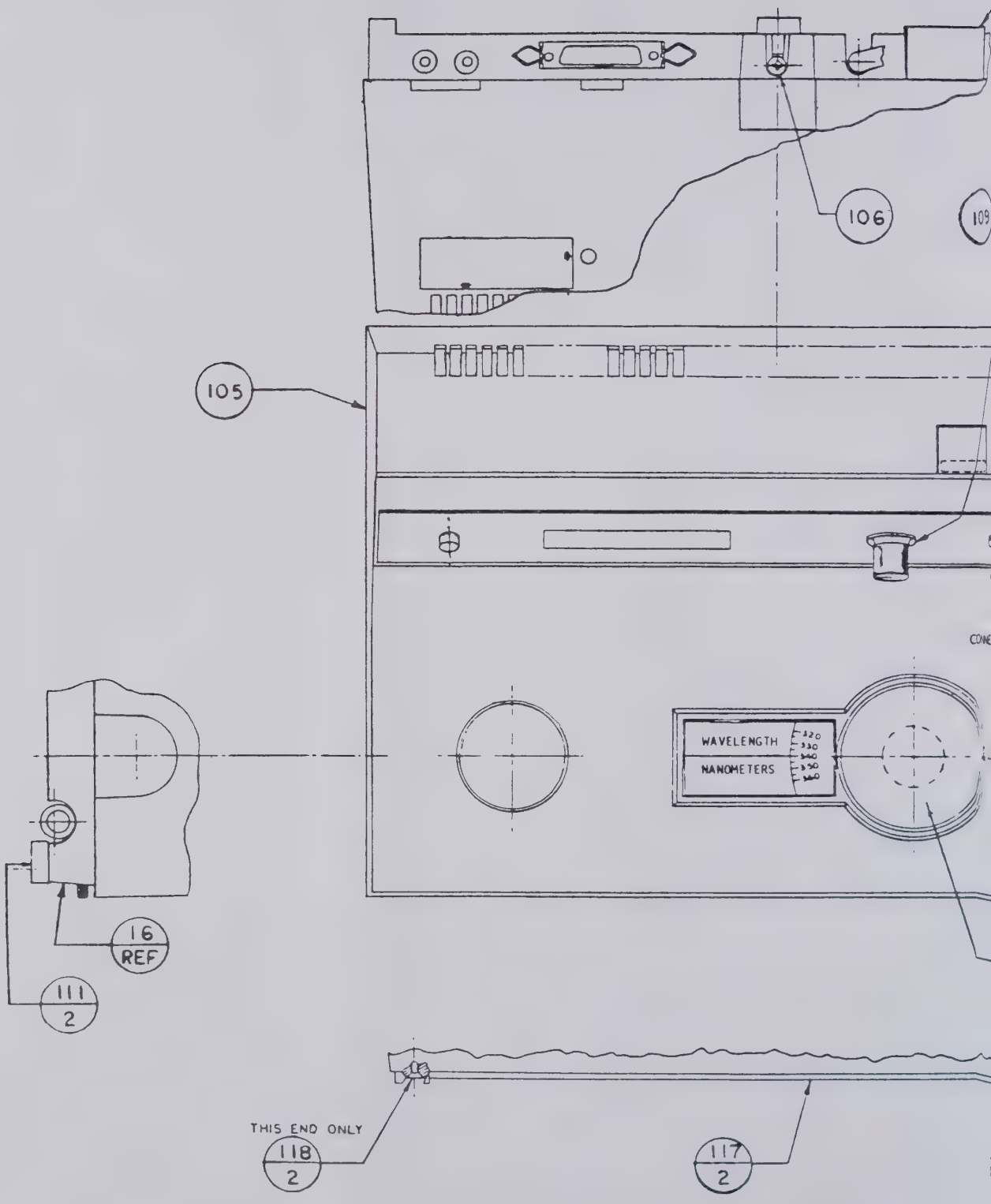


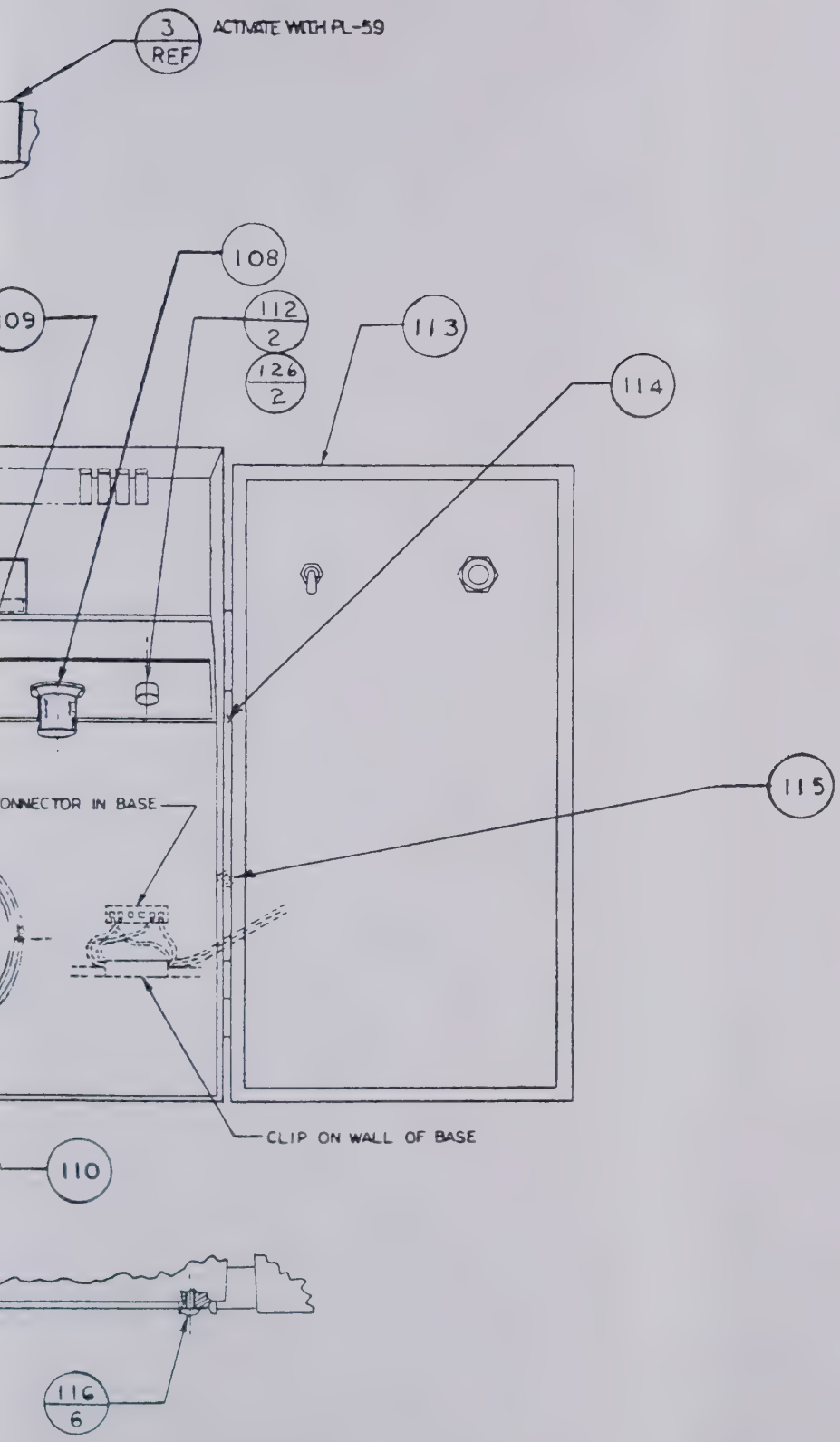
COVER ASSEMBLY

332243-170 REV. D

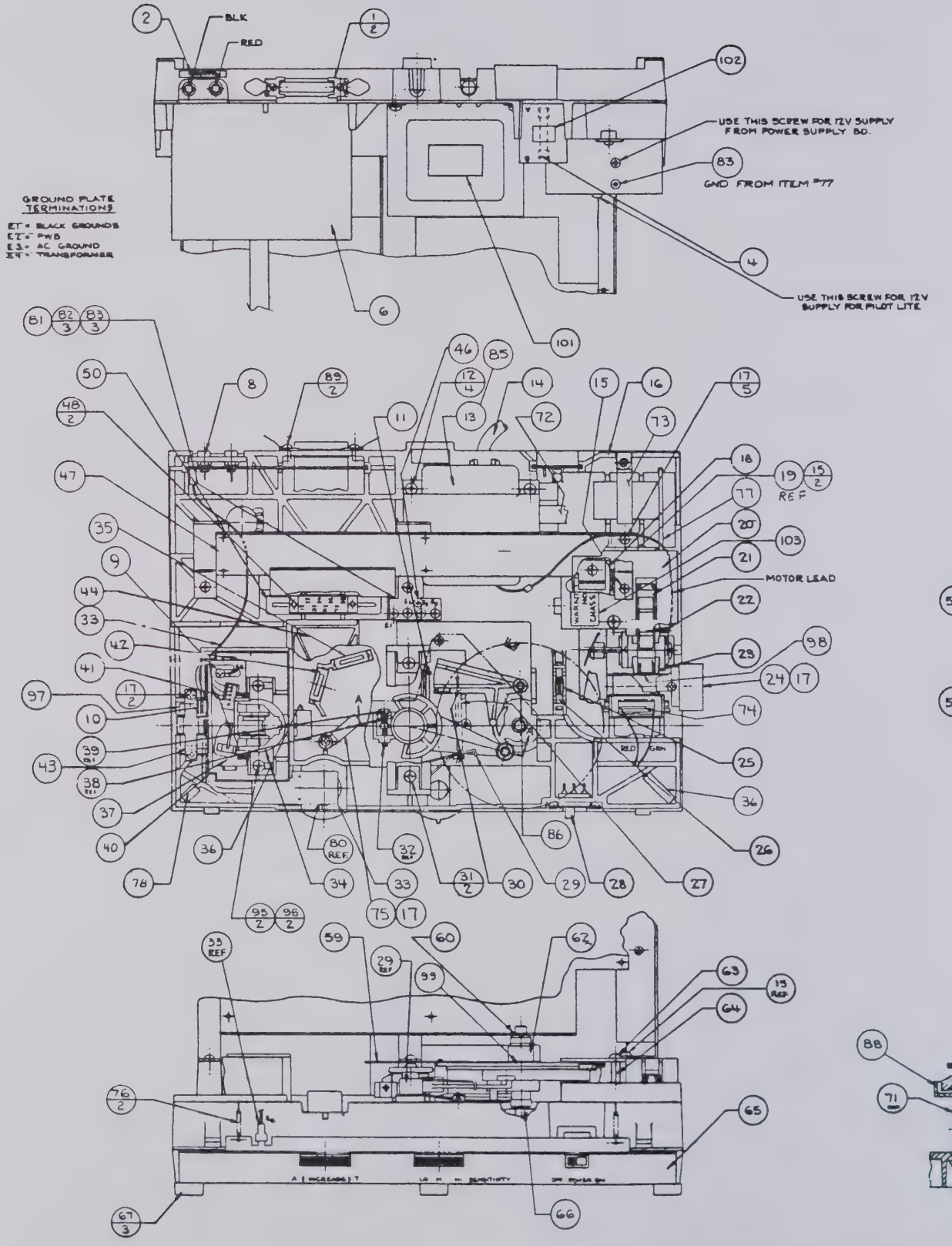
MODEL 332243 MAIN ASSEMBLY
332243-200, Rev. F

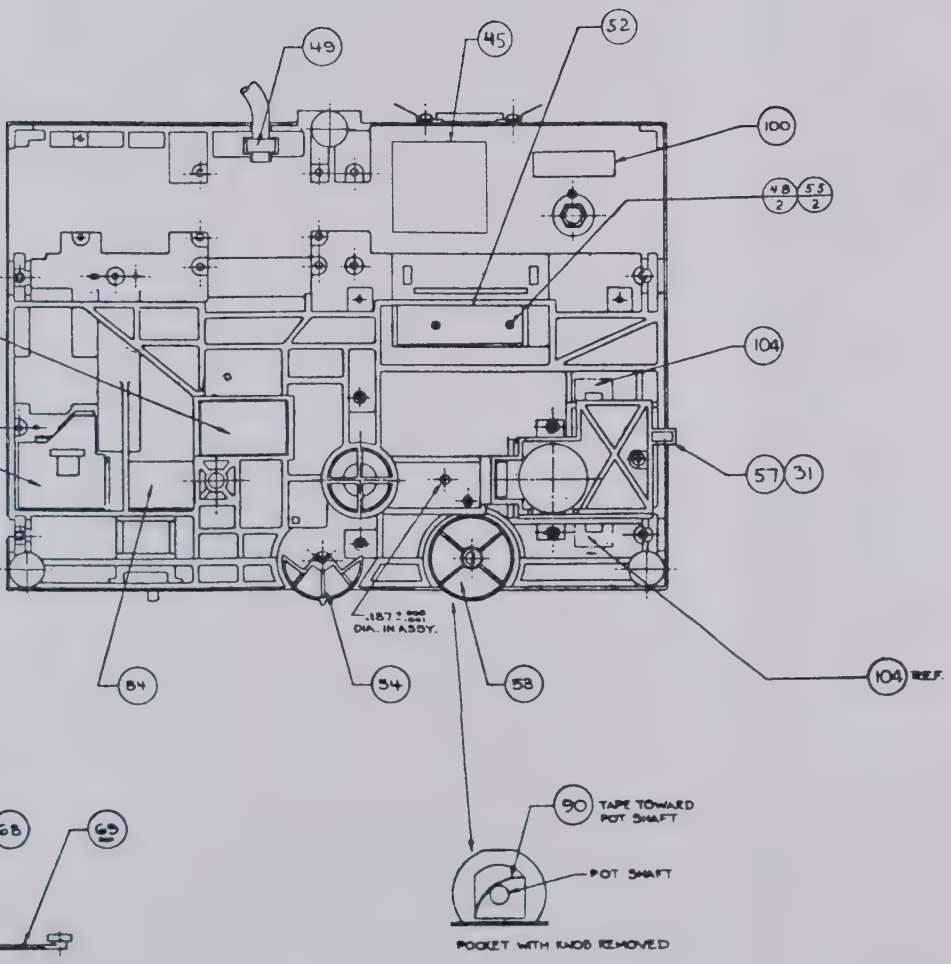
Item No.	Part No.	Description	Item No.	Part No.	Description
1	332201-344	Latch 8 Spring Assembly	66	332201-312	Washer
2	332201-309	Label	67	332201-210	Foot
3			68	332201-329	Strap Assembly
4	333040-1019	Fuse, 2A SB, 250V	69		
5	371988-646	Connector, 2-Pin Molex 03-09-1023	70	332201-165	Ball, SST .1875 Dia.
6	332201-6204	Power Board Assembly	71		
7			72	332201-6074	Flex Circuit Assembly
8	332201-676	Output Jack Assembly	73	332225-119	Clamp
9	333172-141	Screw, #6 x ¼ Selftap	74		
10	371966-111	Cable Clamp DK ½ 188F	75	332225-106	Mirror Mount Assembly
11	332225-133	Entrance Slit	76	332201-260	Spring
12	333172-118	Screw, BT 8 x ½ Pan Rec St	77	332225-6114	Power Board Assembly
13	332226-641	Transformer Assembly	78		
14	332201-677	Power Cord Assembly	79		
15	332201-250	Screw, Pan A 6 x ¾ Rec St	80		
16	332201-105	Base	81	332225-157	Ground Plate
17	333172-119	Screw, BT 6 x ½ Pan Rec St	82	344001-305	Screw Pan #6-32 x ¼ St
18	332201-113	Sync Det. Assembly	83	332501-1181	Lock Washer #6 Ext Tooth
19	332201-724	Heat Sink Assembly	84	332201-315	Plate
20	332201-111	Heat Sink	85	332201-286	Insulator
21	332201-404	Motor Shield	86	333060-315	Truarc 5555-18 Gripring
22	332201-244	Pin, Dowel .1406 Dia.	87	371988-647	Connector Plug 2-Pin
23	332201-644	Motor Assembly	88	332225-158	Grating Assembly
24	332225-104	Lens B Assembly	89	344001-699	Screw, Pan B 4 x ⅜ Rec. St.
25	332201-028	Condenser Lens	90	332201-300	Spring Assembly
26	332201-224	Spring	91		
27	332201-394	Spring	92		
28	332201-731	Switch Assembly	93		
29	332201-301	Spring, Torsion	94		
30	332201-146	Filter Mount Assembly	95	338640-190	Washer #10
31	342501-473		96	334558-401	Screw, Pan #8-32 x ½ St.
32			97	332201-361	Light Seal
33	332201-6184	Potentiometer Power Board Assembly	98		
34	332225-110	Exit Slit Assembly	99	332201-267	Washer
35	332225-102	Mirror B Assembly	100	332201-310	Label
36	332201-269	Pad	101	332201-406	Label
37	332201-393	Sensor Cover	102	332201-395	Label, Fuse
38			103	332201-135	Label
39			104		
40	332201-203	Shroud	105	332243-170	Cover Assembly
41	332223-000	Sensor Assembly	106	332201-143	Screw, 10 x ½ Type B
42	332225-101	Mirror Assembly	107	332243-121	Electrical Plate
43	332201-257	Spring	108	332241-116	Knob Assembly
44	332201-119	Monochromator Cover	109	332241-115	Knob Assembly
45	387592-133	FCC Label	110	332241-110	Knob Assembly
46	343170-777	Ground Label	111	332201-112	Screw, 8-32T x 1½
47	332201-1073	Board and Bracket Assembly	112	332201-278	Extension
48	332201-144	Screw, Pan #4-40 x ½ Nylon	113	332243-250	Lamphouse Assembly
49	332201-289	Ty-Rap	114	332225-222	Juncture Cover
50	332201-397	Switch Plate	115	332225-305	Screw, #4 x ¼ Type Bt
51			116	332231-102	Screw, #8-32 x ⅞ Pan Hd.
52	332201-410	Plate	117	332225-127	Rod
53	332201-292	Knob Assembly	118	332225-131	Screw, #8-32 x ⅞ Fl. Hd.
54	332201-291	Knob Assembly	119	332225-1627	Cable Assembly
55	332201-411	Standoff	120	333040-969	Sta-Strap Pand
56	332201-201	Plate	121	335001-334	Inspector's Label
57	332201-273	Base Cover Assembly	122	332239-000	Hinged Sample Compartment Cover
58	332201-180	Cover	123	333307-000	Lamp Board Assembly
59	332201-283	Index Plate Assembly	124	332201-1648	Cable Assembly
60	332959-136	Truarc 5103 31MD	125	330000-777	Scotch Tape, Double Coated
61			126	332201-314	Button, Black
62	332225-121	Cam Assembly	127		
63	332201-245		128		
64	332201-207	Spacer	129		
65	332201-227	Front Plate	130		


106
109
105
WAVELENGTH
NANOMETERS
16
REF
111
2
THIS END ONLY
118
2
117
2



MAIN ASSEMBLY
332243-200 REV. F
SHEET 1 OF 2

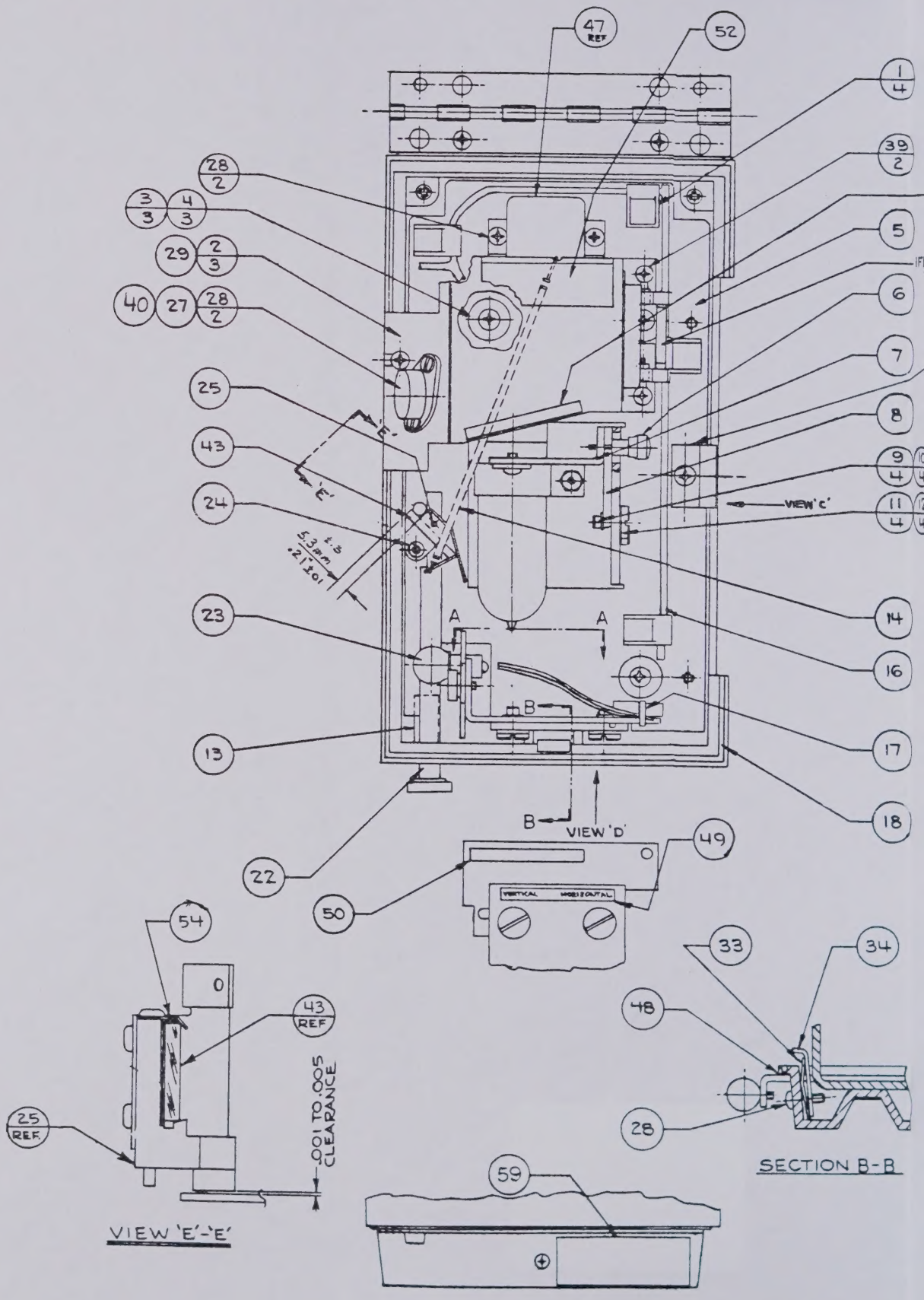

BLK
RED
USE THIS SCREW FOR 12V SUPPLY FROM POWER SUPPLY BD.
GND FROM ITEM #77
USE THIS SCREW FOR 12V SUPPLY FOR PILOT LITE
GROUND PLATE TERMINATIONS
ET1 = BLACK GROUNDS
ET2 = PWB
ET3 = AC GROUND
ET4 = TRANSFORMER
MOTOR LEAD
REF



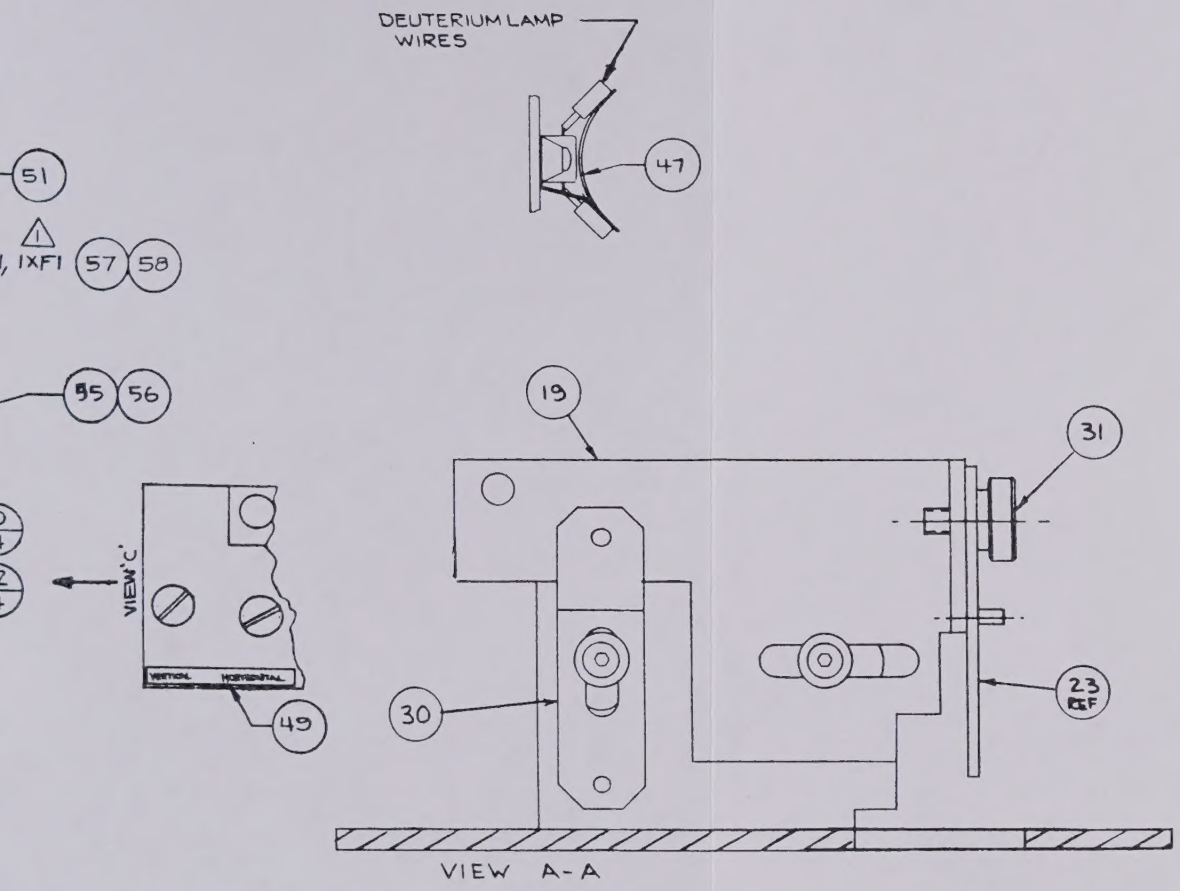
MAIN ASSEMBLY
332243-200 REV. F
SHEET 2 OF 2

LAMPHOUSE ASSEMBLY
332243-250, Rev. D

Item No.	Part No.	Description
1	N371966-111	Cable Clamp
2	S344001-102	Screw, #8 x ⅜ Rec. Pan Hd. Type B
3	S332225-224	Washer, .625 O.D. x 171 I.D. x .062 Thk.
4	S342501-473	Screw, #8 .32 x ⅜ Rec. Pan Hd.
5	332225-230	Assembly Plate
6	A332225-275	Screw Assembly
7	B332225-231	Lamp Mount Assembly
8	B332225-232	Adjustment Plate Assembly
9	S332650-1678	Screw, #4-40 x ¼ Soc. Hd. Cap.
10	S332225-226	Washer, .375 O.D. x .140 I.D. x .045 Thk.
11	B33225-270	Eccentric
12	A338636-202	Spring Washer
13	330000-112	Foam
14	A332225-288	Spring
16	C332225-1606	Cable Harness Assembly
17	333040-969	Sta-Strap # SST 1M
18	E332225-201	Base
19	B332225-256	Mount Assembly
22	B332225-295	Control Rod Assembly
23	B333307-000	Lamp Board Assembly
24	331001-189	Grip Ring, Truarc
25	B332225-298	Shutter Assembly
27	333501-981	Transistor, 2N5759
28	S344001-195	Screw, #6-32 x ½ Rec. Pan Hd.
29	D332225-292	Heat Sink
30	B332225-255	Link Assembly
31	A332225-257	Thumb Screw
33	B332225-177	Latch Spring
34	B332225-208	Latch
35	D332243-120	Assembly Cover
36	S333172-119	Screw, # 6 x ½ Rec. Pan Hd. Type BT
37	C332225-203	Hinge
39	S343001-194	Washer, #8 Ext. Tooth
40	A333041-685	Insulator
41	S332979-233	Nut, 6—32 T Keps
43	B332225-029	Mirror
47	B332225-278	Shield
48	330000-778	Teflon Tape
49	B332225-272	Label
50	B332225-273	Label
51	B332225-274	Label
52	B332225-271	Label
53	A332230-126	Cap Plug BPF-1
54	330000-395	Scotch Foam Tape, Single Coated .032TH x ¼ WD x ⅜ LG Black
55	A332225-166	Retainer
56	S344001-102	Screw, #8 x ⅜ Type 'B' Self-Tap Rec. Pan Hd.
57	S332961-312	Screw, #6 x ⅜ Type 'B' Self-Tap Rec. Rd. Hd.
58	B332225-690	Insulator
1F1 (60)	S332225-689	Fuse, .375A/250V
59	A332225-312	Label



332201-10020



LAMPHOUSE ASSEMBLY

332243-250 REV. D

MP MASTER
MA30659